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PROCEEDINGS OF THE FOURTH CONFERENCE ON LOW-COST RESIDENTIAL SPRINKLER SYSTEMS

federal emergency management agency / U.S. fire administration

PROCEEDINGS OF THE FOURTH CONFERENCE ON LOW-COST RESIDENTAL SPRINKLER SYSTEMS

SEPTEMBER 26-27, 1979
WASHINGTON, D.C.

NFPA®
Conference Managed By:
THE NATIONAL FIRE PROTECTION ASSOCIATION

federal emergency management agency / U.S. fire administration

UNITED STATES FIRE ADMINISTRATION'S
FOURTH CONFERENCE ON LOW-COST
RESIDENTIAL SPRINKLER SYSTEMS

MARRIOTT TWIN BRIDGES HOTEL

WASHINGTON, D.C.

WEDNESDAY and THURSDAY

SEPTEMBER 26 and 27, 1979

Conference Managed by:

THE NATIONAL FIRE PROTECTION ASSOCIATION

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OPENING REMARKS

Gordon F. Vickery

Administrator

U.S. Fire Administration

Good morning, ladies and gentlemen. I'm Gordon Vickery, Administrator of the United States Fire Administration.

From the reports that I have had from the people at the Fire Administration and talking to Ken Backman and his staff, why I think we are all looking forward here to not only an informational and productive meeting, but one in which people have displayed an unusual amount of interest.

This is the Fourth Meeting and I'm sure the NFPA and ourselves and the others who have been involved hope that we are nearing the end here of a vision that a great many people have had.

I think that some credits are due here, certainly to Ken Backman and the NFPA staff, Harry Shaw and his group from the United States Fire Administration; and I guess if you tried to mention all the people that have been involved in this sprinkler program, we would have about ten minutes of introduction.

I think the Center for Fire Research, NFPA people, everyone here has exhibited an unusual amount of enthusiasm and productivity in a new innovative approach to the saving of lives and property in America.

I have had the experience in the past two weeks of being in Phoenix, Dallas, Kansas City, and now back to Washington, and one of the things that I might mention here is that while in Dallas I had a chance to look at ten houses being sprinklered by a contractor in Dallas.

And if this particular program is successful with the Dallas contractor, he looks forward to putting these in an unbelievable number of homes. Dallas is an example of a city in America that has caught this fever and knows that we are close to a breakthrough on sprinklers in residential occupancies.

I have been seven years away from the fire service, just coming back into it now in the past six months. And I'm excited and pleased by some of the progressiveness and the positive thinking that I see occurring in the seven years that I have been gone.

So I compliment you, those of you in the audience who have had the direct effort here of bringing this program to fruition. I might mention a sidelight on the sprinkler program in the fact that we are bringing ourselves close to a breakthrough.

The Fire Administration is now a part of FEMA, Federal Emergency Management Agency. I was discussing yesterday morning at our daily staff meeting that this meeting was occurring and that we would be holding some tests in North Carolina. And uniquely this may be a reference to one of the values of the Federal Emergency Management Agency. The people, who were previously the Federal Insurance Agency, who write insurance nationwide, and who have all of a sudden become interested in this program.

Gloria Jiminez, Head of the Federal Insurance Agency, was a previous deputy insurance commissioner in North Carolina. She wants to have some people from the federal government and North Carolina present at the tests on mobile homes which you are conducting next March.

The federal government also will be retrofitting thousands of trailers and mobile homes, nationwide, that we use to move into disaster areas. That's a two- or three-year program of rehabilitation of mobile homes that the federal government actually lends to people who have been displaced from their homes, and they would hope this program can move rapidly enough that part of that retrofitting could include sprinklers of some kind.

I also had the privilege of being out at the Los Angeles tests and was impressed there with not only the instrumentation, but also the professionalism and the enthusiasm exhibited by the Los Angeles Fire Department.

For those of you who may not have read completely about the tests out there or the facilities and the implication there of the Los Angeles Fire Department, I urge that you do so. It's one of the inspiring things that I have seen as I come back into the fire service.

I might mention here in closing that your good friend Chet Schirmer, of course, is ill and will be unable to be here; but we do have a get-well card out at the desk and so if each of you, some time during the day when you have time, would either jot a little note or put your name in there, we will be sending this to Chet.

I do at this time want to introduce the President-elect of the National Fire Protection Association, a fellow who, of course, was born in the Washington area here and has been associated with the fire service for a substantial length of time. As I have come back into the fire service, I find he is not only one of the most aggressive, but one of the most alert and informed people in fire service circles.

And with his new facility up there in Boston coming into being and with, I think, a new concept at NFPA, those of us who are associated with the fire service can look to this man for a substantial amount of leadership. I think particularly in this meeting or meetings of this type or projects of this type, Bob will have a sincere and abiding interest.

If you don't agree with him, he's always a fellow willing to call you up on the phone or write you a letter and tell you why.

I'd like to introduce at this time my good friend, Bob Grant, President-elect of the National Fire Protection Association.

OPENING REMARKS

Robert W. Grant

Executive Vice President

National Fire Protection Association

It's a personal pleasure for me to be here this morning to help Gordon open the Fourth Annual Conference of the Low-Cost Residential Sprinkler System Project.

My days as a Fire Marshal and Fire Investigator were too often spent fighting residential fires, investigating residential fires, and interviewing people who made up what was left of the families decimated by fire in their homes. And I have said many times to myself that there must be a better way. And I'm sure you have said that, too.

The use of a reasonably priced sprinkler system in dwellings, I think, is a most intriguing development. It means taking an old solution and coupling it with some new thinking, new technology, to solve an old and persistent problem.

In a sense, then, this is a conference of pioneers - people who believe that new thinking, new technology, and old technology can be shaped to shake and provide new answers to our number one fire problem, residential fire loss.

Speaking for NFPA, I can assure you that we will continue to use a major part of our resources towards the resolution of this persistent and tragic problem. NFPA's most recent statistical survey, the 1978 United States Fire Experience, which is published in the "Fire Journal," and in fact you have it, I believe, in your packet of materials, shows that residential fires account for 6,768 civilian fatalities, or 78 percent of the total fire deaths last year in the United States.

There's also a parallel in property loss, where 67 percent of the 1.1 million structural fires fell into the category of residential fires. These fires accounted for nearly $2 billion in loss, some 54 percent of all property loss caused by fire.

Another recent NFPA study, and again that's in the September issue of the "Fire Journal," conducted by Dr. Louis Derry is called "Fatal Fires in America, Statistics and Priorities," and I think this is a most fascinating study.

It's most helpful, I think, in pointing out, in the area of dwelling fire safety, areas for intervention and research.

This study describes deadly scenarios which result in fire deaths. For instance, the misuse of cigarettes and the ignition of upholstered furniture and bedding by these cigarettes. In his report, Dr. Derry also suggests strategies for intervention into these, the most deadly of classic causal chains.

Dr. Derry's study emphasizes that it is only a small number of fatal ignition scenarios, which recur time and time again, that make up most of our nation's fire deaths. It drives home the importance of a comprehensive overall strategy of prevention, detection, alarm, escape, and suppression. We all know that prevention begins with good education.

NFPA's Learn Not to Burn Campaign has worked very hard to make the public aware of general fire safety. The Dick Van Dyke Campaign, and I'm sure all of you are familiar with that, has saved a great number of lives in and around the home.

Another major breakthrough from NFPA's point of view is the Learn Not to Burn Curriculum. This is a major educational tool that we have developed and we are now pressing for its implementation. Our objective here is to have a future generation of Americans trained in fire safety and tuned into fire safety so that ideas like drop and roll, detectors, and home sprinkler systems for fire safety are just second nature to the American public.

And I'm proud to say that a new partner in our implementation phase is the U.S. Fire Administration. Gordon Vickery has shown his long dedication to fire prevention education by underwriting a whole series of curriculum implementation workshops around the country. They are under way, in fact, this week. This week we have had implementation seminars in New Jersey, Massachusetts, and New York State.

I'm confident that they will result in a much broader understanding and use of this educational package, both in the school systems and also in our nation's fire service. And I look forward to including a new section in this curriculum which will be devoted to residential sprinkler systems in the near future.

When accomplished, the development of a low-cost residential sprinkler system would represent a tremendous and significant breakthrough, I think similar to the smoke detector. A residential sprinkler system offers our nation the potential to reduce the annual statistics of life and property loss. And I'm sure that its availability is going to attract attention from the media and from the public as an important safety option that many home buyers are going to welcome.

I would hope, also, that this would result in a reduction in insurance rates for home owners who install sprinkler systems. As you know, NFPA is currently going through the revision cycle for NFPA 13D, the Standard for the Design and Installation of Sprinkler Systems in Residential Occupancies. This standard will reflect the latest technology developed in the current test programs and you're going to hear more about the standard and test programs this afternoon and throughout this conference.

I want to strongly point out a sincere conviction of mine that this whole project represents our federal government and the U.S. Fire Administration at its very best.

It has taken the public and the private sectors, working together in a most complementary way, to carry out this project, and I commend the U.S. Fire Administration for pushing forward in this area of low-cost residential sprinkler systems.

Gordon Vickery, Joe Moreland, and Harry Shaw have been very enthusiastic supporters of this project. The need for residential sprinkler protection is obvious, I think. R and D is risky and costly. Here is where the U.S. Fire Administration has been most helpful working with Factory Mutual, the Los Angeles Fire Department, the sprinkler industry, and NFPA, and others to make this project work.

The information developed in the various test scenarios has been and is being fed to the NFPA 13D Committee for their use in the next revision of the standard. and after adoption of the revised standard will come the task of selling the concept, the standard, to the public and to public authorities.

With the groundwork that has already been laid and the team of dedicated people that are working on this project, I know we will be successful. I don't minimize the problems that lie ahead. In fact the agenda for this conference is really a list of areas of challenge that must be met and problems that must be solved.

Fortunately though, the people who can solve these problems and meet these challenges are at this conference, determined to move ahead, determined to make low-cost residential sprinkler systems a reality for the nation.

I share the confidence of all of you that a successful system will be developed, and that it will fit the criteria of both the technologists and the consumers, and that we will one day come to regard it as an extraordinary contribution to the advancement of public safety in America.

SESSION I - TECHNOLOGY

Dr. John L. Bryan

Professor and Chairman, Department of Fire Protection

University of Maryland

Moderator

Thank you, Bob. I'm John Bryan, your moderator for the technical session this morning. And you heard Bob refer to Harry Shaw. Harry Shaw has been involved in this Residential Sprinkler Program from the very beginning and I know Harry wouldn't mind if I referred to him as the Godfather of the program, because he certainly is.

At this time I would like to introduce Harry for a presentation on the U.S. Fire Administration Residential Sprinkler Program. Harry is the Acting Director for the Home and Public Building Safety Division of the U.S. Fire Administration. He's going to present an illustrated slide presentation relative to the objectives, the aims, and the development of this Residential Sprinkler Program.

The U.S. Fire Administration has been involved in the Residential Sprinkler Program, as you know, for a period of four to five years. Now, what you may not know is that the U.S. Fire Administration, as of next month, is only five years old. So it is largely through the interest and the enthusiasm of their personnel and, in principal, Harry Shaw, that this program has been developed.

Harry.

THE U.S.F.A. RESIDENTIAL SPRINKLER PROGRAM

Harry Shaw

Director for the Home and Public Building Safety Division

U.S. Fire Administration

This morning I will give you a report on the progress of the United States Fire Administration's Residential Sprinkler Program. I will also discuss planned programs for fiscal year 1979 and fiscal year 1980.

Before talking about the Residential Sprinkler Program, let me set the stage with a few words about the role of the Fire Administration and the objectives of the Home Fire Safety Program.

The quoted but unofficial goal of the United State Fire Administration is to reduce fire losses by 50 percent in a generation. This is no small task. The Fire Administration believes that a 50 percent reduction of fire losses will only be attained with a well-rounded plan which includes, but is not limited to, programs in public education, arson prevention, code enforcement and administration, research, and in the use of technology.

Now, the objectives of the Home Fire Safety Program is to contribute to the reduction of residential fire losses using technology in the areas of detection, automatic residential sprinkler systems, and automatic residential remote alarms.

For those of you who may be interested, there is an announcement in your registration folder of an Automatic Residential Remote Alarm System Conference on Friday, September 28. This Conference is sponsored by the Fire Administration and is another part of the Home Fire Safety Program.

Now, let's take a closer look at the fire problem (slide 1).

The numbers have changed since the 1977 Conference, but the percentages are relatively the same.

According to 1978 NFIRS data, residential fires are responsible for:

67 percent of all fire deaths;
60 percent of all civilian fire injuries;
42 percent of all property loss;
29 percent of fire fighter deaths; and
49 percent of fire fighter injuries.

And as if this is not enough, we now have information from our Princeton study which shows indirect residential fire loss at $300 million and 100,000 people experiencing emotional problems. Twenty-five percent of these required special treatment.

Considering the magnitude of residential fire losses, it is safe to say that unless we find solutions to the residential fire problem, we cannot hope to come close to a 50 percent reduction of the nation's fire loss.

Let us now review the findings of the Johns Hopkins University's Applied Physics Laboratory completed study. This study, although not completed at the time, was one of the highlights of the 1977 Conference (slide 2). The study is now completed and a copy is in your registration folder.

An in-depth analysis of the 117 residential fires in Maryland and D.C., involving 171 deaths, 189 injuries, and $2.8 million in property losses, indicated that the potential impact of automatic residential sprinkler systems could reduce deaths by 92 percent; injuries by 95 percent; and property loss by 88 percent.

These are amazingly high percentages. To determine whether the APL fatal fire scenarios were reasonably representative of fatal fires on the national level we had NFPA compare the APL data with NFPA data. The preliminary results of the NFPA comparison were -- the first and second leading scenarios were the same and the percentages were very close. More specifically, smoking was the major cause of fatal fires in living rooms and in bedrooms in both the APL and NFPA fire scenarios.

Another comparison showed that living rooms and bedrooms were the rooms of origin in about 70 percent of the fires in both the APL and NFPA fire scenarios.

I believe these favorable comparisons provide some creditability that the APL data is representative of fatal fires on the national level.

One other bit of information to validate the APL report findings comes out of 1977 Ohio NFIRS data where an analysis indicated residential sprinklers were 85 percent effective in reducing property losses. The APL report indicated an 88 percent effectiveness.

The reduction of deaths by 92 percent and injuries by 95 percent did seem unusually high, so we searched for some explanation. Fortunately, we think we found one by examining the data on room of origin and victim mobility (slide 3). This examination indicated that 95 percent of the victims who were saveable either had mobility or were not found in the room of origin. Accordingly, if one assumes that a sprinkler contained the fire in the room of origin for 20 minutes or even for only 10 minutes, most, if not all, of the 95 percent of the victims could have been saved. The results of some of our FM tests and the Los Angeles test indicated a good possibility of saving some immobile occupants in the room of fire origin.

We will now examine the four phases of the Automatic Residential Sprinkler Program:

Phase I - Was the development of the U.S.F.A. proposed performance standard.
Phase II - Is the support of the development of a new NFPA 13D Residential Sprinkler Performance Standard.

Phase III - Is concerned with improved performance and marketability of residential sprinklers.

Phase IV - Is devoted to promotion of Residential Sprinkler Systems.

Let's get into some of the details of each phase. As I stated, the objective of Phase I was to develop a proposed performance standard. The contents of this standard prepared by FM included the results of a program by Rolf Jensen and Chet Schirmer covering occupant requirements, technical requirements, and potential effectiveness of residential sprinklers. A summary report is in your registration folder. The standard also included technical contributions from a National Science Foundation program by Battelle Research and technical contributions by FM under a Fire Administration grant. We had approximately eighty attendees critique the proposed standard at our third suppression conference. Many of the changes suggested by attendees were included in the final version which was presented to the NFPA 13D Committee in March 1978. It was intended that the proposed performance standard be used as a guide by the 13D Committee in the development of the new NFPA standard.

In my opinion, one of the highlights of the proposed standard was the introduction of the performance concept. This approach will not only lead to innovation but may introduce some technical competition which has not always been present after a company has met the acceptance criteria for its product.

Phase II is the support for the development of a new 13D standard. Today, we are going to hear quite a bit about this standard from Rolf Jensen and the 13D Panel. However, let me mention some highlights which took place during this phase. The results of the FM test program, as requested by the 13D Committee, demonstrated the need for improved sensitivity and improved water distribution for residential systems. The requirement for improved sensitivity became very critical when a current 13D system failed to control the fire in room of origin. Industry, represented by Grinnell, Viking, and Globe, rose to the occasion and produced new innovated hardware. As a matter of fact, the Grinnell head is now being used in the Los Angeles test program. Later in the morning you will learn more about the LA program from the Program Manager Geoff Berlin of NFPA and Site Manager Chief Don Manning of the Los Angeles Fire Department.

As has been the case in all of our sprinkler activity, the Factory Mutual Research Corporation is again making a major contribution. This one is in the Los Angeles test program where their tasks include instrumentation, data reduction, and data evaluaton.

Hopefully, by next February or March our Field Evaluation Program will move to Charlotte, North Carolina. Here we will be conducting a series of twelve sprinkler tests in mobile homes using the proposed 13D system.

It is important for everyone to understand that before the new 13D standard can be presented to the NFPA Membership, three conditions will have to be met. First, it will be necessary to demonstrate that the proposed system is effective. The Los Angeles test program is being conducted to demonstrate system effectiveness. Second, a product acceptance standard will have to be developed. Factory Mutual and the Underwriters Laboratories are working as a team to produce a proposed product standard. The sprinkler industry is participating in this program. Tom Castino of UL will discuss this program this afternoon in Session II. The third condition requires that at least one sprinkler head be accepted and listed in accordance with the new product standard. When these three conditions are satisfied, Chet Schirmer and Rolf Jensen will be able to face the task of obtaining NFPA Membership approval.

Phase III is directed at improvement of sprinkler system performance and improvement of marketability. Let me run through a number of the programs.

First, a program to improve sensing and sprinkler actuation has been awarded to Battelle Research Laboratory. David Doerschuk will present a progress report on this program tomorrow in the afternoon session. I expect to continue Fire Administration support to this activity for many years.

Second, Factory Mutual is engaged in a cooperative effort with industry to improve the sensitivity of fusible links and water distribution patterns. Jack Rhodes of Factory Mutual will cover this and other Factory Mutual efforts immediately following my presentation. I also expect to continue support of this effort for many years.

For future work, we are exploring the possibility of a program which will establish sprinkler effectiveness by droplet size and sprinkler effectiveness by link temperature rating. It will also be necessary to establish test programs for sidewall sprinklers. Hopefully, this will be started during fiscal year 1980. We will also explore the use of plastic pipe in terms of both performance and cost. Plastic pipe may be used in some of the Los Angeles tests. However, it should be understood that even if such tests are successful, plastic pipe will still require testing and listing by a recognized testing laboratory before it can be accepted for use in an NFPA 13D system.

So much for performance and marketability.

Phase IV provides for Promotion of Residential Sprinkler Systems. It is, of course, based upon the assumption that we will have a new 13D standard. Hopefully this will happen no later than November 1980 and, with luck, perhaps even sooner.

This conference is an example of the promotion of residential sprinklers. We believe the dissemination of information is of paramount importance if we are to gain understanding and support for the use of residential sprinklers to reduce our residential fire losses.

We will also establish a program to obtain insurance rebates to minimize the net costs for a residential sprinkler to a homeowner. Ralph Jackson of Allstate Insurance is working with the insurance industry to produce a sprinkler test program to provide information on reduction of fire losses with the use of residential sprinkler systems. These tests will be conducted in December at the LA test site. If successful, this program may lead to an insurance rebate to offset some of the costs of a sprinkler system. Ralph will tell us more about his program tomorrow morning. We really have not addressed the tax rebate program yet. Hopefully, the sprinkler industry will be able to contribute some material and ideas. Although this program hasgreat potential, I am disturbed when I find that the current IRS investment credit table lists commercial sprinklers under "not allowable."

In fiscal year 1980 the Fire Administration will conduct a program to examine some of the more costly obstacles to the use of residential sprinklers and determine ways and means of removing them. We will examine programs to:

Remove the requirements for metering;

Remove the requirements for back-flow prevention; and

Remove excessive permit fees.

Last week the Fire Administration issued a grant to the IAFC Foundation to establish a directory of all current residential sprinkler activity in the United States. There will be four directories issued at six-month intervals over the next two years. The directory will contain:

Community identification;
Description of program;
Status of program;
Key individuals - telephone numbers and addresses;
Sources of funding; and
Other pertinent data.

The availability of this data should assist communities in the development of sprinkler programs tailored to their individual needs.

Another program is being developed to help solve the community house fire problem in Washington, D.C. The Lamont Street disaster in which twelve people died was the most recent example. There are over 700 of these community houses in Washington, D.C., and many more throughout the United States. Most, if not all of them, because of construction and occupant problems, present a serious fire threat. The Fire Administration, in conjunction with the D.C. government, is establishing a program to retrofit one of the community houses with a residential sprinkler system. This program will establish a model, provide cost information and demonstrate a solution to alleviate the fire threat presented by community houses.

The media not only has expressed interest in the program but wants to be involved from the beginning to the end. We hope to have the sprinkler system installed before the end of the year.

Another major promotion program we and NFPA are now planning will take place in January 1980 at the National Home Builders Association's Annual Meeting in Las Vegas. Sixty to 70 thousand home builders are expected to attend. We will conduct a three-part program including:

1. A thirty-minute presentation on residential sprinklers;

2. A room exhibit showing the installation of a number of different types of sprinkler heads; and

3. A "meet the experts session" where all home builders' questions will be answered.

Because of the importance of this program to the sprinkler industry, we have requested their support and guidance.

Although we still have a long way to go before residential sprinklers are in every new home, we have made some progress since our program started in

June 1976. As usual, the progress is a result of the efforts of dedicated people and organizations. Tonight, we will honor the Factory Mutual Research Corporation, Chet Schirmer, Rolf Jensen, and Dr. Kung. Primarily, through the efforts of FM, Chet, Rolf, Kung, and the support they received from many others, we have improved the possibility of residential sprinklers playing a major role in the reduction of our nation's fire losses. Although we still have a long way to go, I am confident that with the continued support of the participants of this conference - and that includes all of you - sprinklers will ultimately play a major role in the reduction of residential fire losses. THANK YOU!

DR. BRYAN: (Moderator) The next item on our program this morning is the Factory Mutual Room Fire Tests. You heard Harry Shaw refer to the efforts of the testing program of the Factory Mutual laboratories relative to the development of the residential automatic sprinkler system.

And this morning we have John M. Rhodes, better known as Jack, Vice President and Chief Operating Officer of the Factory Mutual Research Corporation, to present to you the information on full-scale laboratory fire testing of residential automatic sprinkler systems.

Jack.

THE FACTORY MUTUAL ROOM FIRE TESTS

John M. Rhodes

Vice President and Chief Operating Officer

Factory Mutual Research Corporation

At the risk of saying something you already know, I will share with you something of a summary of why we are here, where we have been and where we seem to be going with residential sprinklers (slide 1).

Several years ago the National Commission on Fire Prevention and Control pointed out in its historic document America Burning (slide 2) - the urgent need for improved fire protection of residential occupancies. Their report really underscored what the statistics have been telling us year after year: the dismal fire record of our nation's residences, especially the one- and two-family residence. Year after year, our nation's citizens suffer traumatic loss of property (slide 3), and, more tragically, loss of life. Any way you look at it - by number of fires, amount of dollar loss, or injury and loss of lives - it is a record not to be proud of. Among the industrialized nations of the world, the U.S. stands at the top (slide 4) - or should I say the bottom - of the list, in terms of fire casualties. When one looks at building fires (slide 5), in particular the one- and two-family dwellings, the residential building accounts for most of the fatalities and property damage. It is a big slice of an unappetizing pie.

Besides these unflattering statistics, there are indirect costs or social costs - call them what you may - something that hasn't been quantified until recently. A study of residential fires in 1976 for the United States Fire Administration estimates over 100,000 people suffered emotional problems after experiencing a fire (slide 6), and over a quarter of them required counseling. Overall, indirect dollar losses covering such items as temporary shelter, medical service, and lost wages were estimated in the range of $220 to $320 million (slide 7).

For the typical homeowner and apartment dweller, however, fire protection has been in the form of occasional messages in the media on keeping matches out of the reach of children, safe use of Christmas trees, and the like. More recently, the National Fire Protection Association's Learn Not To Burn Campaign has been a more notable success as a human element motivator.

As for actual physical fire protection, however, only smoke detectors (slide 8) have received much attention - and that only recently. A standard for a residential sprinkler system has been available. But it is based on industrially oriented standards (slide 9), and system costs have been considered too great for the average homeowner. For example, (slide 10) here you see part of a sprinkler system installed in a $50,000 home during construction. The installation costs were $2000. They would have been even higher, but the system design was handled by the owner himself, who happens to be a fire protection engineer.

Thus, sprinklers (slide 11), the most effective means yet devised by the wit of man for automatic fire suppression, have been confined almost

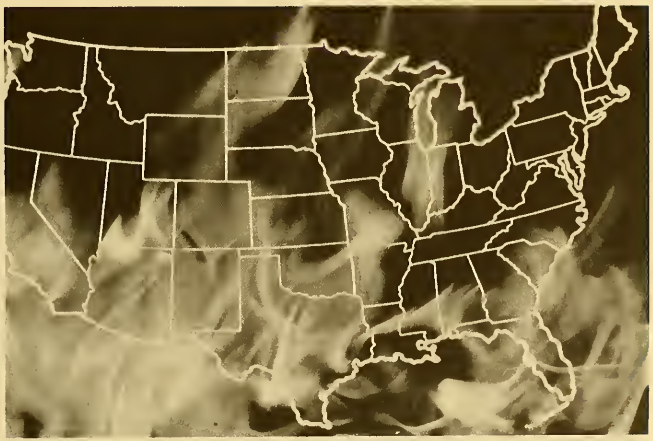
Full Scale Fire Testing
of Residential Sprinklers

1

AMERICA
BURNING

2

3



4

5

100,000 People
Suffered Emotional Problems

6

$220,000,000
$320,000,000

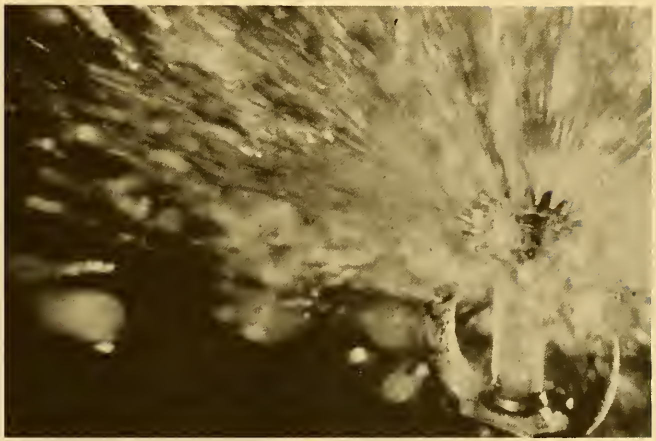
7

TIME
Factory Mutual System
Approved

8

9

10



11

exclusively to the protection of industrial and commercial properties. And they've done a fine job of it. Factory Mutual's statistics clearly reflect this success. In the 1860s before the automatic sprinkler appeared, fire losses at Factory Mutual insured properties averaged over thirty cents per hundred dollars of insured value (slide 12). Since then, as sprinklers were installed in industrial and commercial properties, this figure dropped steadily to a level of two to three cents in recent years (slide 13).

The New England textile manufacturers (slide 14) increasingly adopted perforated pipe systems after about 1850. These manually actuated systems were followed by the more effective Parmelee automatic sprinkler in the late 1870s. This first practical automatic sprinkler consisted of either a salt shaker- or turbine-type distributor shell covered by a cap that was held on with a low-melting solder (slide 15). Exposed to fire, the solder would melt, the cap would fall off (slide 16), and water would be distributed to the fire below. In the 1880s, what is now known as the Grinnell Fire Protection Systems Company joined Parmelee and shortly introduced an improved sprinkler - one that resembles today's sprinkler (slide 17). In the early 1950s, as a result of some Factory Mutual Research, a sprinkler with significantly improved distribution appeared and was adopted as the present standard sprinkler (slide 18). Yet the emphasis has always remained on industrial applications.

About three years ago, the United State Fire Administration (slide 19) funded a number of projects aimed at the development of an affordable sprinkler system for the residential property. Factory Mutual is proud to have been a part of this activity. Its part has been to develop design parameters and fire test residential sprinklers. Such a system should effectively control a fire in a home (slide 20) or apartment, thus providing improved protection against injury, loss of life, and property damage, while using significantly less water than now specified in the NFPA Residential Sprinkler Standard 13D. The system would use low-cost plumbing and domestic water supplies, thus making system costs more affordable.

The findings at Factory Mutual had been most encouraging. It was found that a low-pressure sprinkler system could provide adequate protection for both occupants and property (slide 21). Adequacy of occupants' protection was verified (slide 22) by the fact that carbon monoxide concentration and gas temperatures at eye level remained low enough, long enough to allow for escape or rescue. Adequacy of property protection was verified by the fact that temperatures at the ceiling surface remained low enough to prevent flame spread over combustible interior finish.

However, these tests involved relatively slow-growing smoldering and nonventilated flaming fires (slide 23) and commercial sprinklers having relatively sensitive, heat-actuated elements or links. I specifically mention the link (slide 24) because, as it turned out, this seems to be the key to overall success on the domestic scene.

Last September, a series of tests was requested by the 13D Subcommittee on Residential Sprinklers of the National Fire Protection Association and authorized by the United States Fire Administration. Again, using a commercially available sprinkler for these tests, the setting was a more fully furnished living room (slide 25): a vinyl upholstered chair near one wall; a sofa near an adjacent wall; drapes hung at the window behind the chair; and a wood end table at the intersection of the two walls. The wood frame walls

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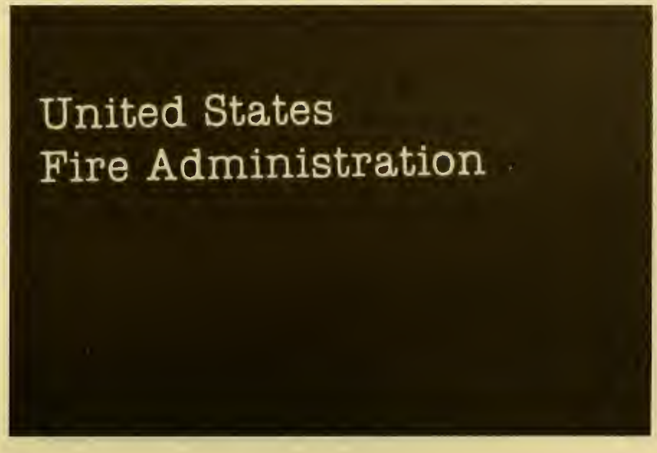

United States
Fire Administration

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(slide 26) were finished with plywood paneling nailed directly to the studs; the ceiling with combustible tiles. Ventilation was provided via open windows and an entrance door. A match was used to ignite paper trash stuffed into a plastic wastebasket (slide 27) that was located beneath the end table (slide 28). In these tests, we were dealing with a flaming fire in combustible wall and ceiling surfaces and plenty of air - quite a challenge for sprinklers.

In this scenario, using a commercially available sprinkler and link, at 0.10 gpm/sq ft (4 mm/min) density, there was rapid fire growth even before sprinkler actuation. That wastebasket fire doesn't appear impressive at first. But, watch what happens when the side of the chair becomes involved. You're now looking at a rapidly growing fire, spreading in rapid succession to the drapes, then the sofa, and finally the wall paneling and ceiling tile. By the time the sprinklers operated, temperature levels and carbon monoxide concentrations were already too high. The environment was already too hazardous for people to survive in the room of fire origin and too many sprinklers operated. Protection of property was obviously inadequate. Air temperature at eye level (slide 29) peaked at over 500 degrees F (270 degrees C); carbon monoxide (slide 30) at 10,000 ppm. The ceiling surface (slide 31) temperature reached a maximum of 1200 degrees F (650 degrees C).

As you have just seen in the film, existing hardware (slide 32) used according to the existing 13D standard was not adequate. Even a sensitive commercial sprinkler does not respond early enough in a ventilated fire to establish control and assure a survivable environment. The heat-actuated element simply does not respond fast enough to a change in temperature of the air around it. A 165 degree F rated sprinkler link will operate when its temperature becomes 165 degrees F (+ or - maybe 5 degrees F). But, the air temperature around it at the time may be around 400 degrees F. Air temperature at the ceiling directly over the fire may be 500 degrees F or even higher.

The question then becomes, how does one increase sprinkler responsiveness sensitivity (slide 33)? Sensitivity, of course, is related to the surface and mass of the sprinkler link itself (slide 34). On the basis of fire test results, we estimated we needed a sprinkler link or bulb more sensitive by a factor of five than the most sensitive commercial link (slide 35) to be able to confine the test fire to the immediate ignition area. Essentially this meant a smaller link (slide 36). In addition, the less demanding environment of a residence, as compared with an industrial building, should allow other less stringent design requirements than those of a commercial sprinkler intended for industrial use.

Such a smaller, more sensitive link was made for subsequent tests. The smaller size and reduced mass is quite obvious in this comparison with a standard link.

With these thoughts in mind, I am pleased to be able to say that significant improvement in performance has been evident during recent tests. Here is another short film sequence, this time showing the difference a high sensitivity link makes. The fire scenario was again a ventilated flaming fire in a furnished living room, with combustible wood paneling over wood studs, and with combustible ceiling tiles. Again, we have a fire starting in the wastebasket. Then spreading over the side of the vinyl chair (slide 37). But that's as far as it goes as the sprinkler starts operating. You'll agree, I'm sure, this fire is quite different from the uncontrolled blaze you saw

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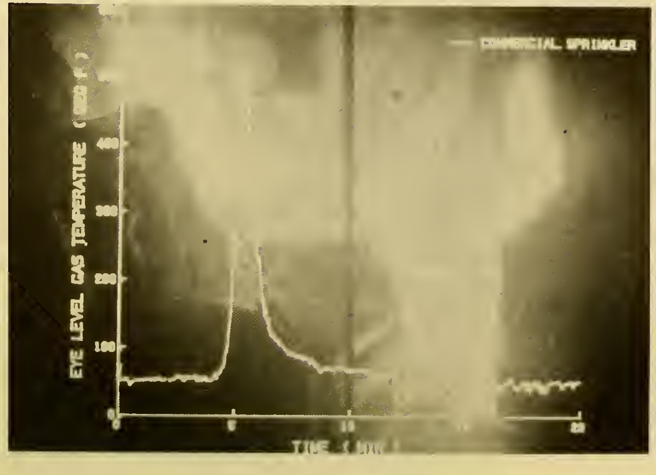
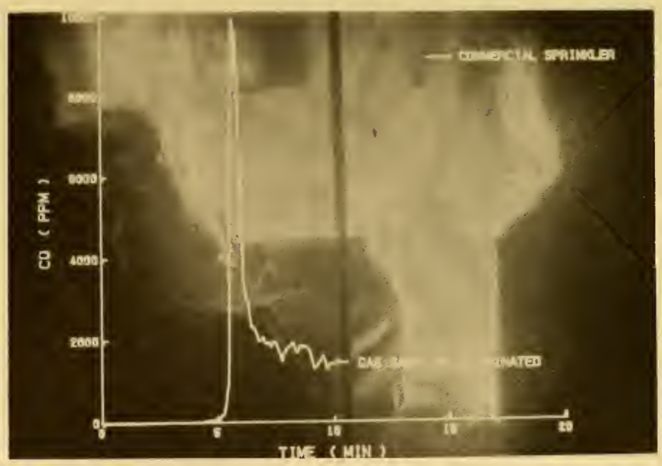
27.

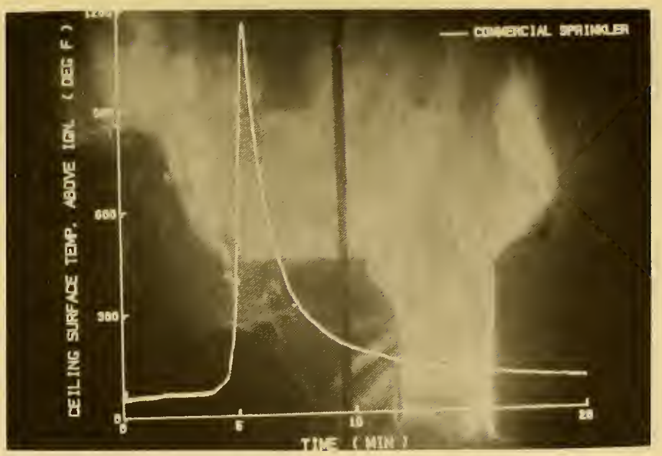
28.


COMMERCIAL SPRINKLER
EYE LEVEL GAS TEMPERATURE (DEG F)
0
100
200
300
400
0
5
10
20
TIME (MIN)

29

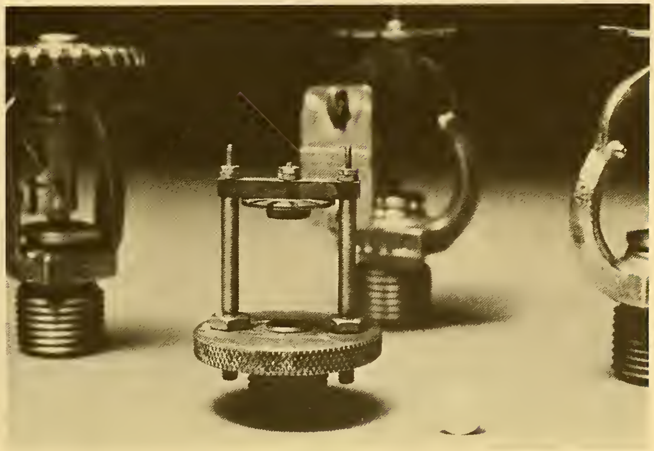

CO (PPM)
10000
8000
6000
4000
2000
0
0
5
10
15
20
TIME (MIN)
— COMMERCIAL SPRINKLER
GAS
NATED

30.

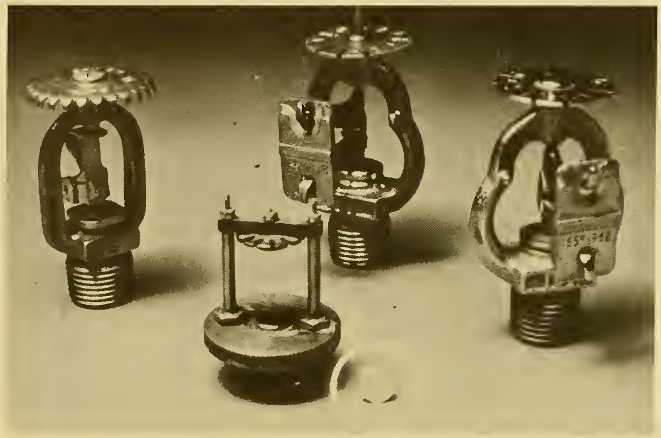

CEILING SURFACE TEMP. ABOVE IGN. (DEG F)
1200
900
600
300
0
0
5
10
20
TIME (MIN)
— COMMERCIAL SPRINKLER

31.

32.

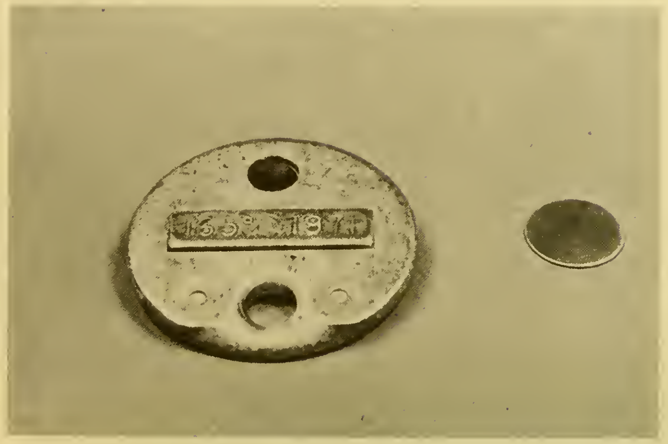


33.



34.

35.



36.

37.

earlier. This and other related fire tests clearly demonstrated that a prototype sprinkler activated by the new high sensitivity prototype link provided effective fire control, which is defined as an environment in which the human animal can survive. We also found that a density of (slide 38) 0.08 gpm/sq ft (3.2 mm/min) at the first sprinkler, dropping to 0.06 gpm/sq ft (2.4 mm/min) with two sprinklers operating, was effective. Water demand was (slide 39) 18 gpm (68 L/min), a considerable reduction from the present 13D standard. The distribution pattern was also satisfactory (slide 40).

Note also the relatively low carbon monoxide concentration (530 ppm max), gas temperature at eye level (slide 41) (90 degrees F, 32 degrees C max), and ceiling surface temperature (slide 42) (200 degrees F, 93 degrees C max).

Following up on these developments, the United States Fire Administration has made a grant to the National Fire Protection Association to test in actual dwelling (slide 43) fires prototype sprinklers with high sensitivity links provided by sprinkler manufacturers. I am happy to acknowledge that Factory Mutual, as subcontractor, has been responsible for the installation (slide 44) and monitoring (slide 45) of test instrumentation and the analysis of test data. Of the work itself, you will hear from Dr. Berlin presently. Current plans call for prototype sprinklers to be tested subsequently in a mobile home environment as well as the more traditional residence.

The results of this research to date are being made available to the sprinkler industry to assist them in developing the new breed of residential sprinkler. In fact, we have already started to test some prototypes in the same scenario used in the research. Here's what one of them looks like (slide 46), compared with a standard commercial sprinkler. Here's another one (slide 47).

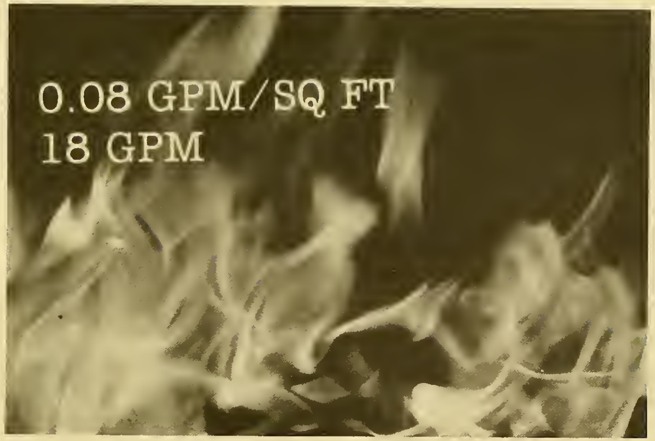
Another related and highly necessary activity: new evaluation standards are being prepared by Factory Mutual and Underwriters Laboratories (slide 48) under the same grant from the United States Fire Administration, using the same data. You will hear more about this activity this afternoon.

In the meantime, the Fire Administration has given the test results (slide 49) to the National Fire Protection Association's Subcommittee on Residential Sprinkler Systems as an aid to their revision of the current standard. You will hear more about this phase also this afternoon.

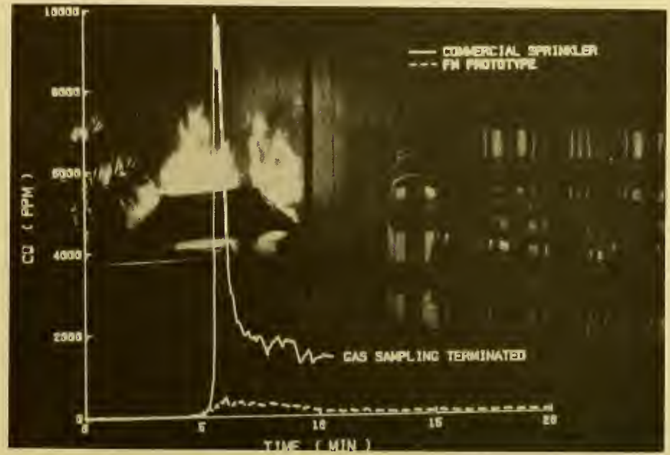
I don't think it's an overstatement to say that we stand at the threshold of a new era (slide 50) in fire protection engineering. Development of this new concept in residential fire protection (slide 51), involving not only a technically effective but also an economically practical sprinkler system, can hardly be viewed as other than a milestone in the history of fixed fire suppression. The road (slide 52) may be about to open to a more economical, practical means of handling one of society's more costly problems - the residential fire.

0.08 GPM/SQ FT

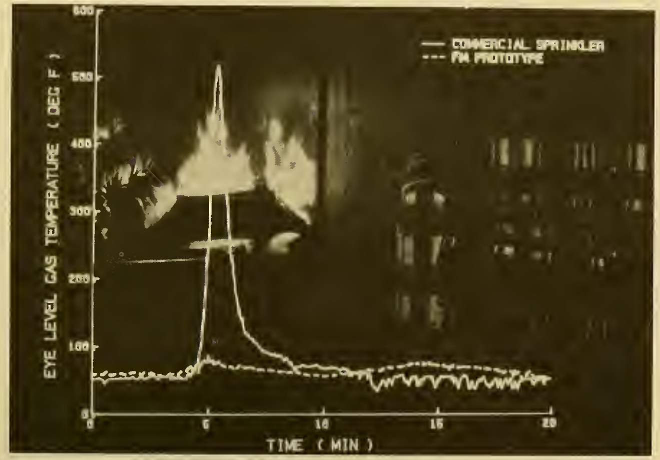
38


0.08 GPM/SQ FT
18 GPM

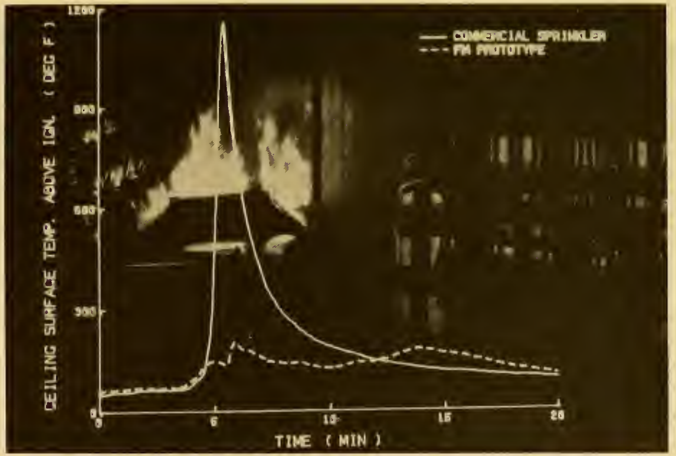
39.


CO (PPM)
10000
8000
6000
4000
2000
0
0
5
10
15
20
TIME (MIN)
— COMMERCIAL SPRINKLER
--- FM PROTOTYPE
GAS SAMPLING TERMINATED

40.

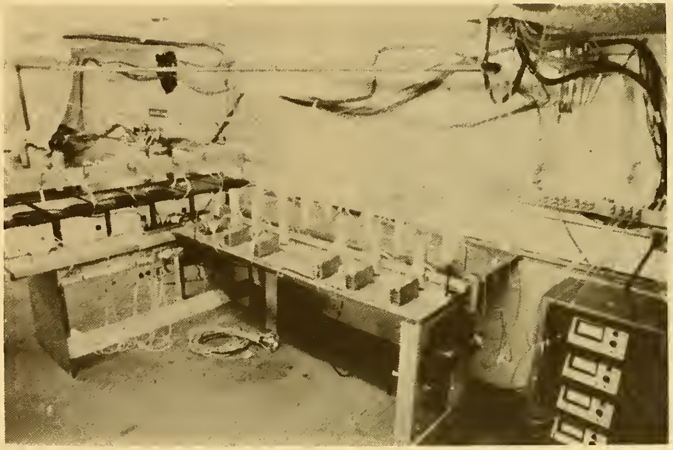

EYE LEVEL GAS TEMPERATURE (DEG F)
600
500
400
300
200
100
0
0
5
10
15
20
TIME (MIN)
— COMMERCIAL SPRINKLER
--- FM PROTOTYPE

41.


CEILING SURFACE TEMP. ABOVE IGN. (DEG F)
1200
900
600
300
0
0
5
10
15
20
TIME (MIN)
COMMERCIAL SPRINKLER
FM PROTOTYPE

42.

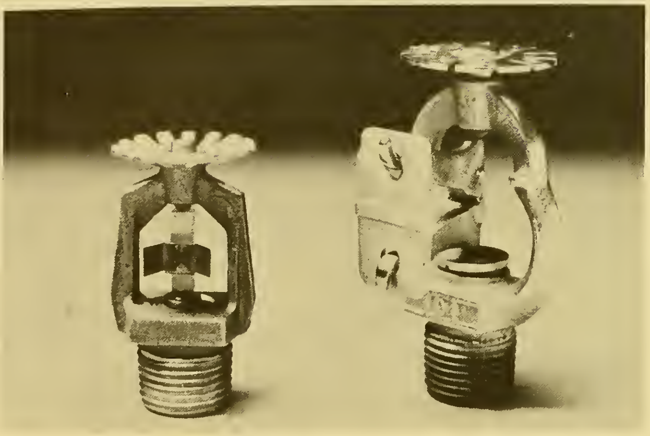
43.



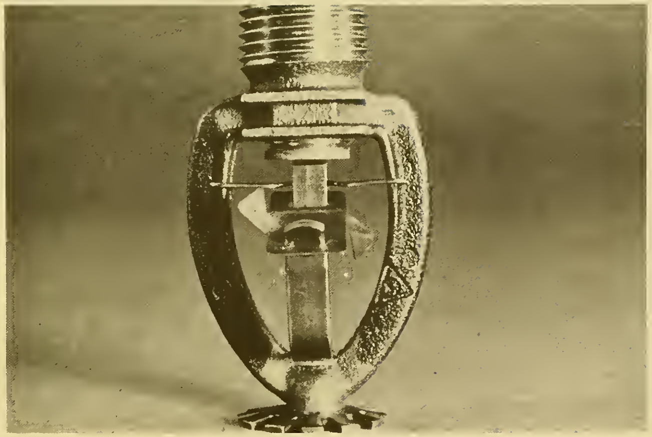
44.

FLOW METE

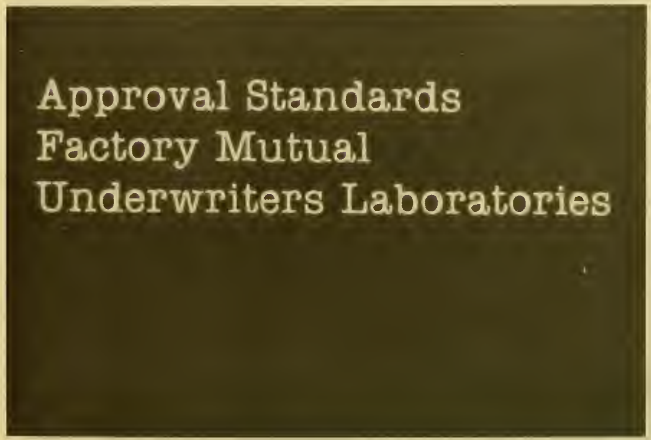
45.



46.

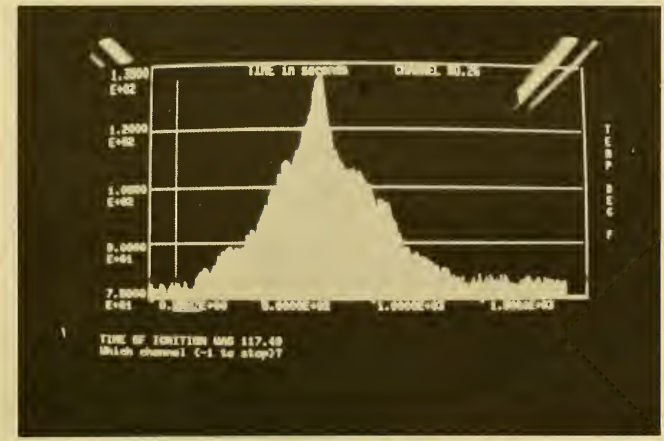


47.



Approval Standards
Factory Mutual
Underwriters Laboratories

48.



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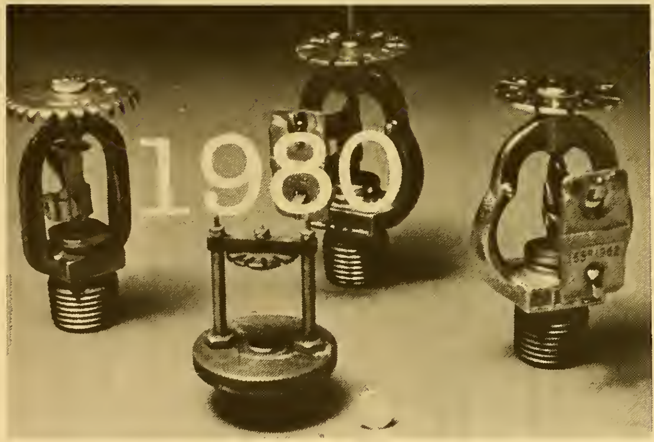
TIME OF IGNITION WAS 117.40
Which channel (-1 to stop)?
```

49.



50.

51.

52.

DR. BRYAN: (Moderator) Thank you, Jack. We have some time for questions. I would like those of you who have questions to come to the center mike; give your name and affiliation.

MR. ANDREW SABHLOK: (Building Code Action, Berkeley, California) I'd like to know what's the repeatability of the second test that you showed us on the film? And what was the convection rate in that room? Have you made any measurement to ensure that the air entering in that room under the first condition versus the second condition was cooler in some way in reference to magnitude and direction?

MR. RHODES: Would you please repeat your question.

MR. SABHLOK: The second fire which you showed, in which you used a prototype sprinkler head with the more sensitive head - I would like to ascertain whether or not that test was repeated several times to show whatever results you have obtained just happened to be a coincidence or could be repeated on a consistent basis? That's question No. 1.

Question No. 2 --

MR. RHODES: Let's hold question No. 2. My memory span is only so long. The answer to your question is yes; it's repeatable. It was repeated; it was repeated several times. It was repeated in Los Angeles for all practical purposes.

MR. SABHLOK: Where was the original test conducted?

MR. RHODES: It was conducted in Norwood, Massachusetts.

MR. SABHLOK: You made more than one test?

MR. RHODES: We made more than one test.

MR. SABHLOK: Second question is how did you ensure that the inflow of the air from the outside under several circumstances was the same?

MR. RHODES: We didn't. We made measurements of air movement through doors and windows and they were not always the same.

MR. SABHLOK: Thank you.

MR. RHODES: Thank you for your question.

DR. BRYAN: Anybody else with a question? Dave.

MR. DAVID HAMMERMAN: (Maryland Fire Marshal's Office) My name is Dave Hammerman. I'm the Chief Fire Protection Engineer for the Maryland Fire Marshal's Office and also a member of the 13D Subcommittee. Presently, Director, Codes Administration, State of Maryland. And, interestingly enough, I witnessed the test that got a bit out of hand in the first film that you saw.

And I'm pleasantly surprised to see that we have success now.

There is expectation that we can extend the 13D concept to a large number of domiciliary-care homes in Maryland, and this expectation will hopefully be in the next year. And it could result in providing this kind of protection for about a thousand homes.

My question is this, as an authority having jurisdiction, where do we go with approving a system for which we do not have on the marketplace today the available hardware for purchase?

We can follow the published 13D Standard, 1975 edition, and feel somewhat confident that it will not be adequate for all types of residential environments. Or we can follow the direction of the committee and work to develop the hardware that is unavailable.

The problem I have is where do we go today if we can put in a thousand systems tomorrow; but may not be able to do this next year if the timing is not right.

MR. RHODES: If I understand your question, it's what should we put in today?

MR. HAMMERMAN: That's right.

MR. RHODES: Unfortunately, I don't think I'm competent to answer your question.

MR. HAMMERMAN: Can someone from industry say "tomorrow you can go to the hardware store and buy a new market head?" Or will we have to wait until 1985?

MR. RHODES: Rolf, do you want to respond?

MR. ROLF JENSEN: (Rolf Jensen & Associates, Inc.) Yes, I guess I better. Dave, if you would come to our committee meetings, you would hear it. Dave is one of our good members on 13D. We are aiming at a point in space or maybe time at which hopefully all of these efforts will come together.

Remember what Harry Shaw said this morning, there are three significant events, each of which must happen for the current proposed changes in 13D, which largely evolved from the Factory Mutual work that Mr. Rhodes has just described, plus the backup data he's done in Los Angeles, to be realized.

The LA test must provide the verification of the FM data. That's still desired and needed, and it points somewhat to what Mr. Sabhlok was talking about.

Second, Tom Castino this afternoon is going to talk about this other program that Mr. Rhodes alluded to, which is the development of a performance test standard for the hardware, for the manufactured product, or, if you will, the residential sprinkler. That's going to have to come to fruition.

And third, you're going to have to have the actual manufactured product accomplished by the sprinkler manufacturers. All three will have to come together. Right now our hope is that that point in time is November of 1980. If you were to say I've got to do it tomorrow, you simply do not have available the hardware to do it tomorrow.

All right? You will not have that hardware available until approximately the end of next year. Now, let's, at the same time, keep one other thing in perspective. And we are getting ahead of our program. Your question would have been much better this afternoon at the panel session, Dave. It might be better to bring it up again then because there are some things which are going to be filled in which have not yet been said today.

The 13D standard, when it's revised, will call for a residential sprinkler system which is tied with this thing. Okay. Second, this is the other thought I wanted to get in, remember, we went right up to that day, October 19 or 20, I believe, if I remember, 1978, when you were there up in Norwood when we thought we were going hell bent for 0.04, and we were even looking seriously at 0.02 as being a successful system.

But the 13D Committee said let's run some tests with some flaming fire just to be sure, and oh, oh, it didn't do it. And we got set back.

Dr. Kung, who has worked his bloody fool head off on this thing, had his chin on the floor that day, so did Jack and so did I and so did Dave, and we expect it to come up again.

But the fire that we are having trouble with is the flaming fire, a fast start, with a fully ventilated room condition. All the other FM data and the Battelle data says with the smoldering fire, slow development, you do it with 0.04. So we are not that bad off. We are not talking about all the residential fires. We are talking about handling the flaming fire as well as the smoldering.

MR. HAMMERMAN: I'll just emphasize one point, which was the prompting of addressing this issue now rather than later. And it was to let the commerical people know, the installers of systems in the commerical market, know that there is a market for this kind of system and it can extend somewhat beyond the one- and two-family dwelling environment where only a single family resides.

It can go into new programs such as a limited domiciliary-care environment where a homeowner or family may take in two or three persons and be funded by the state, a state such as Maryland, and through that reimbursement program they must meet certain criteria, one of which will be a 13D sprinkler system.

So there is a market for it and we are hoping to see the hardware. I realize we have prototypes now, but we also have programs now. And those programs have to get into the regulatory system and unfortunately our timing is not too good.

We have a chance to get into a program now, but we can't feel very confident with what we have at this time.

So I hope at the end of the conference we will have some good direction to go in.

MR. RHODES: If I may attempt a summary--: currently the hardware is not available, but there is a market for it. Manufacturers should move in and develop it. Is that a fair summary of what you were saying?

MR. HAMMERMAN: Yes.

DR. BRYAN: Any other questions for Jack? Yes, sir.

MR. RICHARD A. GILLESPIE: (Woodbridge, Virginia, retired fireman) The two tests that we saw, 165 response and 135, what was the relative response time of these two tests?

MR. RHODES: What was the response time of the elements? I'm sorry, I do not have those data available. I'll be glad to get them for you if you like.

DR. BRYAN: Yes, sir.

MR. JOHN TRAW: (ICBO) Was there any attempt to measure smoke levels during the tests?

MR. RHODES: There were attempts to measure smoke level during the tests. The attempts were successful. Smoke levels were measured.

MR. TRAW: Are they published in a report?

MR. RHODES: They will be; I don't have them available at the moment.

MR. TRAW: What was the ceiling height used in the test room?

MR. RHODES: Roughly eight feet.

MR. TRAW: You mentioned carbon monoxide. Was there any attempt to measure any other by-products?

MR. RHODES: Carbon dioxide was measured.

MR. TRAW: That's part of the test report?

MR. RHODES: Will be.

DR. BRYAN: Yes, sir?

MR. ROBERT WILGING: (B.F. Goodrich Chemical) I was interested in your report where you mentioned that you were successful with 0.08 gpm per square foot utilizing the improved head. Did your experiments include water flow at lower distribution rates with the improved heads?

Something Mr. Jensen said that earlier experiment with slower growing fires indicated possible use of 0.04 and 0.06.

MR. RHODES: The limits were not explored. There is so, so much work that we would love to do, that all of us associated with this development would love to do. The administration has been most generous, but the funds are still limited.

And it costs real dough to run a test of the sort that I shared with you here this morning. It's going to be a long time, if ever before we ever have what many people will consider to be a complete log of data. And in this regard please remember the industrial automatic sprinkler has been in existence now for over a hundred years. It's something we live with day in and day out. A large part of my own life is devoted to exploring its characteristics and its care and feeding. And there are just an awful lot of things yet that I would like to know; that everybody else associated with automatic sprinklers and their use would like to know.

So it may be quite a while before all possible questions are answered.

DR. BRYAN: Thank you very much, Jack.

We will move along on the program now to what you have heard referred to as the Los Angeles Full-Scale Residential Fire Test Program. The first presentation relative to this program will be given by Dr. Geoff N. Berlin, the Director of Research of the National Fire Protection Association.

THE LOS ANGELES FULL-SCALE RESIDENTIAL FIRE TEST PROGRAM

Dr. Geoffrey N. Berlin

Director of Research Division

National Fire Protection Association

The film (KNBC News Film) dramatizes the potential benefit of a residential sprinkler system to limit fire development to the room of origin. This is significant because at least seventy-nine percent of all fires which caused deaths in one- and two-family dwellings resulted in flame damage beyond the room of fire origin according to data in NFPA's FIDO file. Contrasting the complete destruction of the dwelling when a sprinkler system was not present to the discoloration when there is a quick response sprinkler head puts into perspective such concerns as water damage, installation costs, and perhaps even some aesthetic considerations.

With funding support from the U.S. Fire Administration, the NFPA is working with the Factory Mutual Research Corporation, the Los Angeles Fire Department, and McNeary Insurance Consulting Services. The project is to test the performance of a quick response sprinkler head developed by Grinnell in two types of residential occupancies. An executive committee including Chief Gerard of the LAFD as Chairman, Ken Backman, Irwin Benjamin, Graham Clarke, Russ Fleming, Rolf Jensen, H. Kung, Don Manning, and Tom Waterman was established to guide the experimental project. The test program will include at least thirty tests to be conducted by the LA Fire Department in a single-family dwelling and there are plans for McNeary to conduct at least twelve tests in a mobile home.

These tests are designed to demonstrate the expected benefit of a residential sprinkler system and to provide data for the preparation of NFPA's 13D standard. As a result, a majority of the tests are being conducted in the three rooms of a residential occupancy that are the origin of an estimated eighty-five percent of all residential fatal fires - living room, kitchen, and bedroom. All test conditions are designed to present challenging, but realistic, fire development scenarios.

Thus far, a number of tests have shown that the prototype quick response head is effective in controlling fire development for a prescribed period. At a future meeting, Dr. Kung from Factory Mutual will present a technical report on the performance of the prototype sprinkler technology. However, at this time, Chief Manning from the Los Angeles Fire Department and Test Site Director will describe the testing program in the single-family dwelling.

I would like to turn the program over to Chief Manning, Don.

THE LOS ANGELES FULL-SCALE RESIDENTIAL FIRE TEST PROGRAM

Donald O. Manning

Assistant Chief

Los Angeles Fire Department

Thank you, Dr. Berlin. Actually, I think he preempted me there on everything. But I would like to go through a few things that we are doing at the test site. I would like to stress to you that this is a very strong cohesive group that is putting this program together.

The U.S. Fire Administration, NFPA, Factory Mutual, and LAFD, I have never worked with a group that comes from such diverse interests in the sense of what they are normally doing to work on this program and have such a beautiful cooperation. It has really worked fantastically for me.

I think that the first question that comes up is, "Why Los Angeles?" All the tests were done in Norwood, originally. That's on one side of the country. And then we move everything to Los Angeles. Well, there was a very good reason for that.

We had conducted in Los Angeles, in fact in this particular home, a large number of full scale fire tests involving fire detectors.

During the detector test program we conducted about thirty-eight tests in this particular home and about thirty-six in another home. We felt this would be a beautiful opportunity to run some of the same tests in the same house equipped with a sprinkler system. This way the data could easily be compared without having changed too many variables.

We know what happened in the detector test when we would terminate the fire or try to terminate it at 500 degrees and now we would have a sprinkler system in there and see what the difference was. So a very strong effort was made to make the scenarios, the furniture, the layout, the instrumentation, as identical as we could.

We did improve measurably in this program over what we did in the other program and I'll take you through some of those steps in a little bit with the slides.

There was a lapse of several months between the detector test program and starting the preparation work for the sprinkler test program. This necessitated a lot of work to restore the house to live-in-like condition.

Initially, as was mentioned, the house was a quarter million dollar house. It had some nice things in it like hardwood floors. One sprinkler test on a hardwood floor and they kind of wrinkled up and it changes the whole burn pattern and everything. So we came in and sealed the floors, put in scuppers, completely rebuilt the house so it was a test house, but a live-in type of condition.

In a house of this age - it was originally a wood lathe house - it meant we had to, in many cases, redo walls and ceilings using sheet rock to bring it back to what might be considered modern construction. We weren't trying to burn it down.

Once the decision was made to move on in and install instrumentation, once that decision was made, things went fast. Starting in about June of this year, people started arriving, equipment started arriving, and modifications to the house were started. The Factory Research Mutual Corporation sent their top people from Norwood, Mass. to supervise the installation of the instrumentation.

Now, what I'd like to do with the slide packet is take you right through from the beginning of where we started developing the plans and right on up past the press conference that you have seen and into some of the tests that we have run.

Okay, that's the logo of our sugar daddy (slide 1). This is a slide, although it is my title slide, this one is taken exactly at the instant the sprinkler head fused, and if you look carefully you can see the parts in mid-air there and you're practically looking at the first water to come through that head (slide 2).

This is Dr. Geoff Berlin (slide 3). He is the principal investigator of the project, the total responsibility for the project rests on his shoulders. He gets many, many calls from me when things don't work right.

The site that we are using, as you can see, is right near the end of the runway at LAX (slide 4). All of the streets that are marked off to the right of the slide or laid out there used to have homes in them. And gradually these homes were condemned because of the noise problem and removed.

When we got into our first test program, we went to the Department of Airports and a lot of the area still had homes on it. We told them what we wanted to do. They gave us a full list of their homes and said let us know what you need. So at that time, we had taken two sites of two homes each and now we have one site, which is the sprinkler test site, of two homes (slide 5).

Two homes: the one on the left, is used as the command house. In the basement is all of the instrumentation. The tile-roofed house is the test house (slide 6). There is a complete fencing system around it, burglar alarm system, motion detectors, everything to determine if we ever get entry. We just can't accept anybody coming in and doing a number on us.

There is an executive committee that provides help to Geoff in administering the program (slide 7). And this committee is made up of all of the interests that could possibly be involved in this program. And this is one of their meetings in Los Angeles.

Even at coffee break, I can assure you it was sprinklers; everybody was talking sprinklers.

U.S. FIRE
ADMINISTRATION
SPRINKLER TEST
PROGRAM
LOS ANGELES
1979

1.

United
States
Fire
Administration

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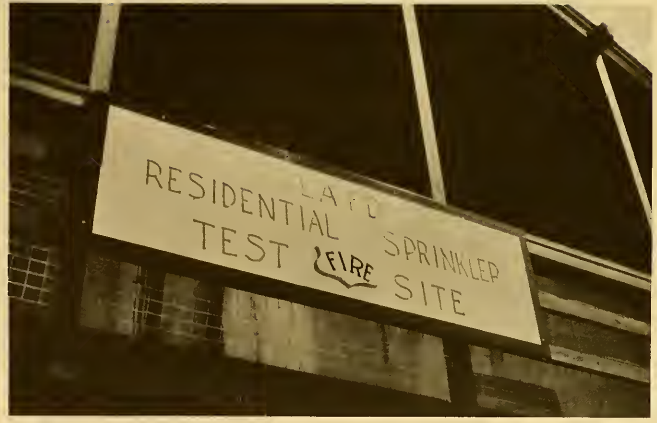

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One of the things the committee approved and recommended to Geoff was the scenario packet (slide 8). The first twenty scenarios are based very, very closely on the prior detector test scenarios. Some slight modifications would be where we would add a scenario to have a ventilated fire in the living room, and open the living room windows, which we did not do in the detector test. The only windows we opened in that program were the bedroom windows, opened and closed configuration.

The plans had to be drawn; we had plans of the house, but we did not, of course, originally anticipate putting a sprinkler system in it. So Grinnell undertook that job of drawing up all the plans for installing the sprinkler system (slide 9).

Eventually in the home, we ended up with almost two completely separate sprinkler systems, one based on 150 square feet per head and the other on a lesser amount, somewhere between 64 and a 100 depending on the room, but taking into account all of the constraints of 13D proposed.

Grinnell also installed the sprinkler system for us and when they started arriving, the pipe arrived (slide 10). I have never seen so much copper pipe in my life (slide 11). You have to remember every head in this house is individually piped out of the house. They do not branch off of anything. Each of them comes out to its own separate valve on a manifold system (slides 12, 13, 14).

We did not take a great deal of care in hiding the pipes. In this particular case, it was not necessary. Now, all the pipes were, however, put into the ceiling area. We could not have exposed piping in the house, but the exterior piping is exposed.

Now, you can see the runs starting to come here out of the first floor of the house and down to the manifold system. Each, again, particular sprinkler head is valved off separately, and this is only the amount of valving necessary for the first floor. We also sprinklered the garage and the second floor (slides 15, 16, 17).

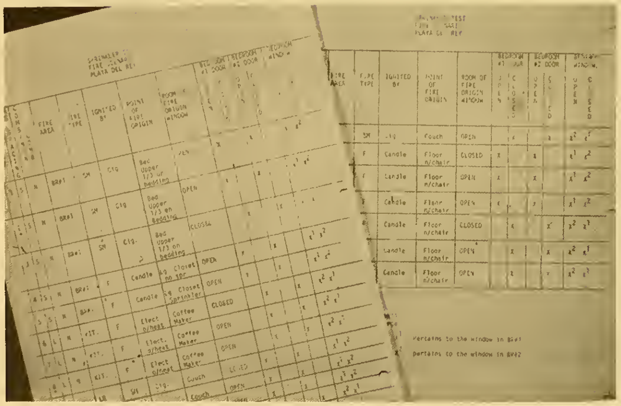
The water from the street main comes into the command room, which again is in the house next door, through a control valve, through the flow meter, and then back into the manifold system for the sprinkler system (slide 18).

The three gages, the large gage you see up at the top, are there to measure flow pressure at the heads we designate or feel are going to principally operate in that particular test. This is where those gages are then hooked up to the particular heads, so we have kind of a manifold system for each scenario.

If we feel the head in the kitchen is going to open up, we connect the No. 1 gage to be the reader.

We marked all of the valving (slides 19, 20). This was done primarily for our press day so it would have a high visibility. But as you can see, there is a red system and a blue system and the blue system is the 150 square feet and the red system is the closer density or closer head spacing.

As I mentioned earlier, we sealed the floors, used exterior grade plywood, and installed scuppers so we could remove water from the house easily. The scuppers, during the test, do not allow ventilation into the home (slide 21).



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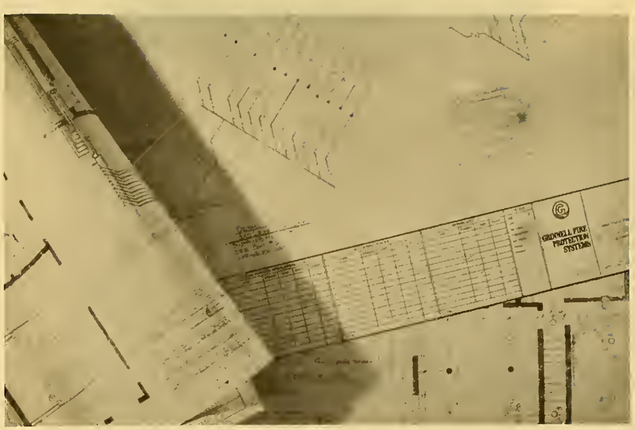

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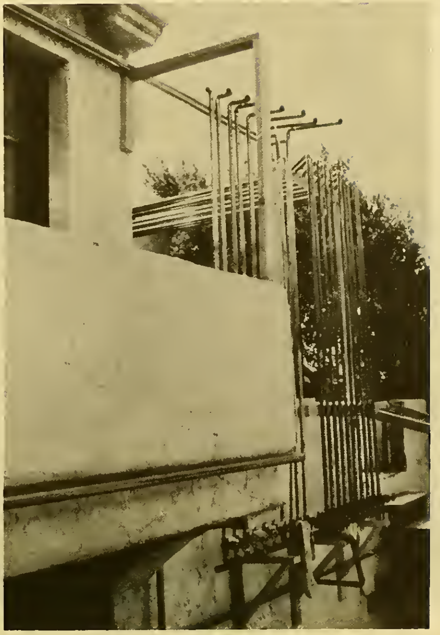

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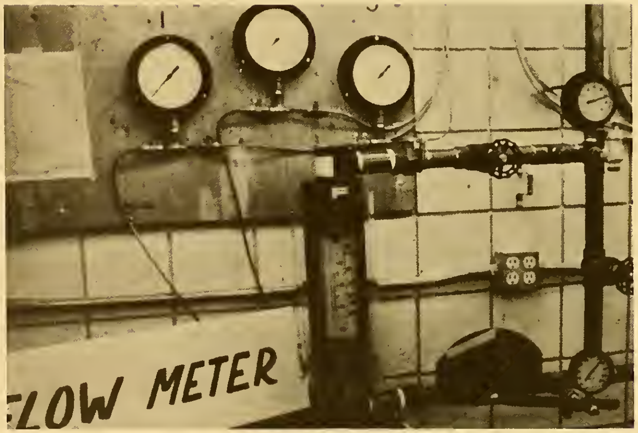

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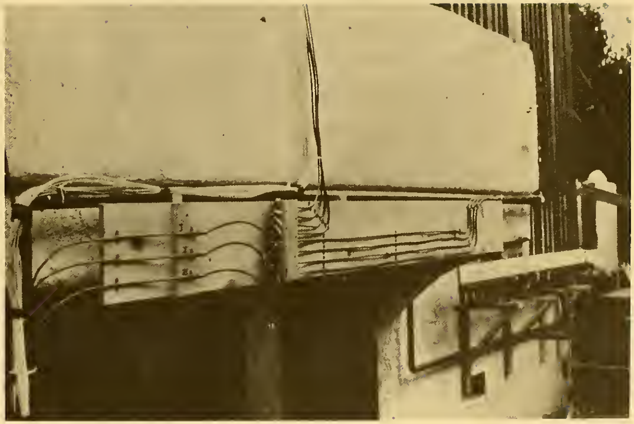

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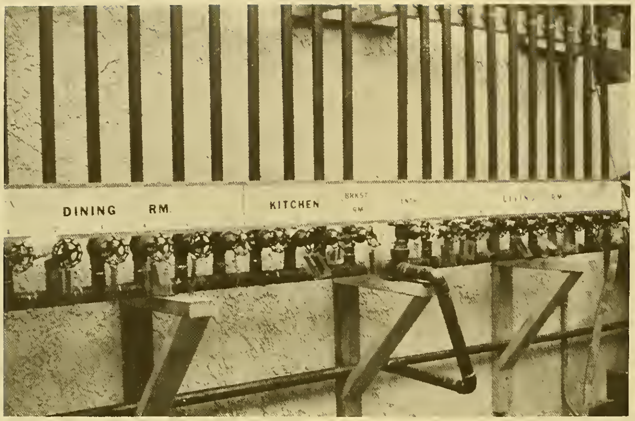

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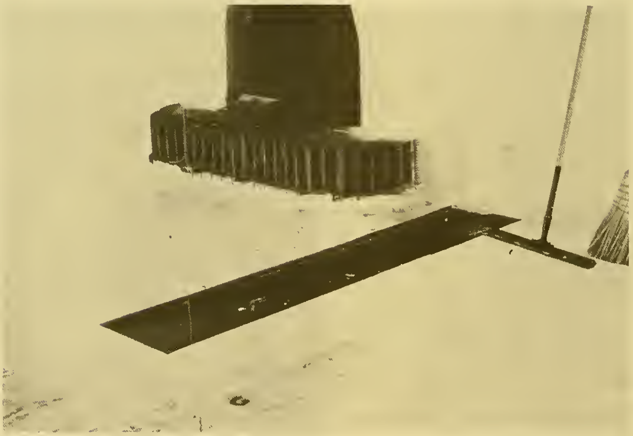

This is a typical installation (slide 22). It happens to be in the living room. The disc on the far right there rises at the same temperature rate as does the link in the sprinkler head, so we monitored that thermocouple on the computer so we know exactly what the temperature of the link is at the time it fuses.

Of course, the fast response sprinkler head and then the Tee pipe next to that is to measure air velocity in the vicinity of the sprinkler head. We also have those that are in operation when the window is open to measure the air velocity in that area. And then there is a thermocouple wrapped around the air velocity probe there to determine what the temperature is at the probe.

This is one of the two types of smoke beams that we have in the house (slide 23). This one is at the bottom of the stairs as if you were to exit the home. We had one also at the top of the stairs and the bedroom and so forth to measure the smoke. They were at the five foot level.

Now, right behind there you can notice two aluminum tubes. One terminates at the five foot level and another one goes on down to the three foot level. Those are used to pull air samples from the room. This again is done at the top of the stairs, bottom of the stairs, center of the living room, kitchen and so forth.

And from the room of fire origin, we pull the gas sample at the three foot level as well as in the center of the room.

This is the other type of smoke beam (slide 24). The first one was furnished to us by ADT. This one was furnished to us by Factory Mutual. It was designed to sustain high temperatures where the first one would be destroyed at 200 degrees or above. So this is one we always move into the room of fire origin and use it.

You notice the air sampling probe with a funnel on it, and that's what it is, a funnel. That's put on there so when the sprinkler head operates, it acts as a rain shield and keeps it from pulling water down into the sensors.

The air velocity probes then come down into the basement of that house which houses most of our instrumentation, and on the right are the instruments to measure air velocity (slide 25). Then it electronically sends the message to the computer in the basement of the adjoining house.

The aluminum tubes coming down to the left of that go through filters, each of them pulling an air sample from a room, go through a filter, through a dryer, through an air pump, and then over to the individual instrument that measures carbon monoxide or oxygen, oxygen being the one on the lower left.

So with the individual instruments, rather than a multiplex or some type of device that would rotate the application, we are able to get absolutely constant readings (slide 26).

All of the information, the temperatures and the smoke density and gas levels and so forth, comes into the computer and the computer scans all forty-five channels every ten seconds, and it stores the information on a floppy disc.

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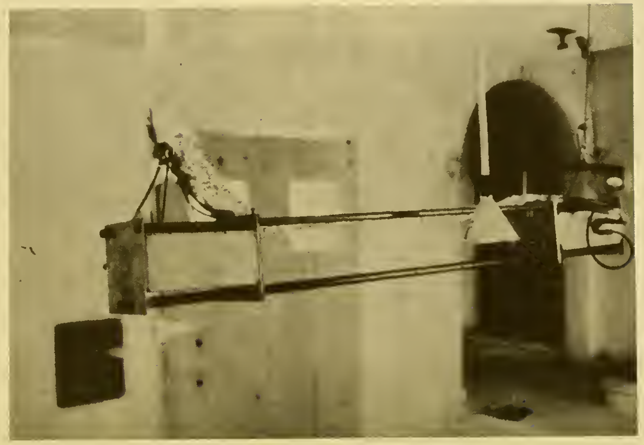

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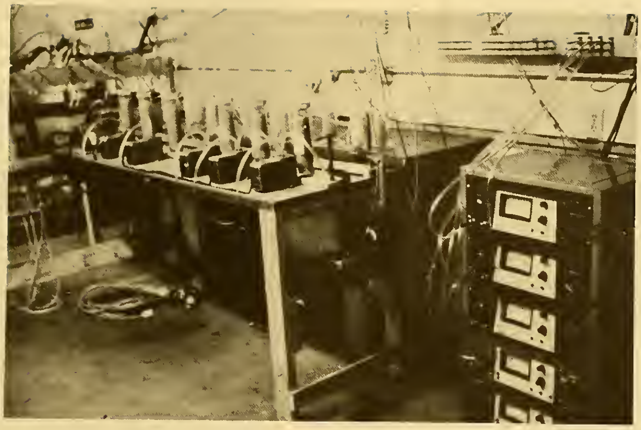

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To also help with the data, we have two completely separate color video recording systems (slide 27). One camera is always on the point of fire origin, which is the one on the left which we designate camera one, and the one you may be able to pick up on the monitor there in the living room scene (slide 28).

The other camera normally shoots down from behind a glass enclosure, down the stairway, and what you would see looking down that stairway if you had walked out of the bedroom.

I might emphasize that the camera is never inside the house. It is always shooting through a view-port (slide 29).

This is the recording equipment, again two separate systems (slide 30). Up on the top shelf next to the small monitors are the time/date generators and impressed on the video tape and on the screen is the fire time starting absolutely at point zero when we start the test and the date.

The time/date allows you to synchornize video tapes with computer data later.

Chief Gerard, who chairs the Executive Committee, made several visits to the test site while we were installing the instrumentation. (slides 31, 32). This slide shows me explaining the flowmeter to him. (slide 33).

We hooked up clocks, which we used in the detector test program, to the sprinkler heads so we could tell how much time into the fire before they activated and how many have activated. So again, at the instant that the countdown goes to zero, the clocks start running. When the sprinkler head fuses, the clock stops and the light comes on.

That is not too tough, and we enter that into the computer when the sprinkler head activates. But when you get two, three, or more heads to open, at that point in time the observers cannot tell you visually for sure. So that's why we went to the electronic method which tells us very directly and records that time for us (slide 34).

The digital read out, there in orange, is two of the smoke beams and those are the ADT beams. We could read those directly on the digital readout during a test and they also were recorded in the computer automatically.

On August 6, we had an Executive Committee meeting in Los Angeles. We then came to the test site for a firsthand visit of the facilities to see what was there. And at this point in time, we are going through the living room area.

The NFPA staff and the Los Angeles Fire Department staff worked for weeks ahead of the press conference to put together all of the little things (slides 35, 36). As a matter of fact, just in the Los Angeles area, we sent out eighty-six press announcements and, of course, the East Coast end was handled by NFPA. We had very good results.

We blocked the street in front of the test site and set up a speakers' platform (slide 37). As you can see, the ocean is just right there in back. Our timing and everything was right (slide 38). We had the sun in the right direction to do this; it was good. We established visitor signs in areas and press signs in areas.

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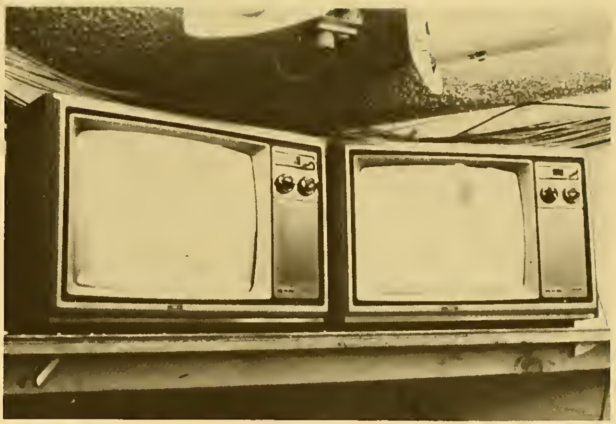

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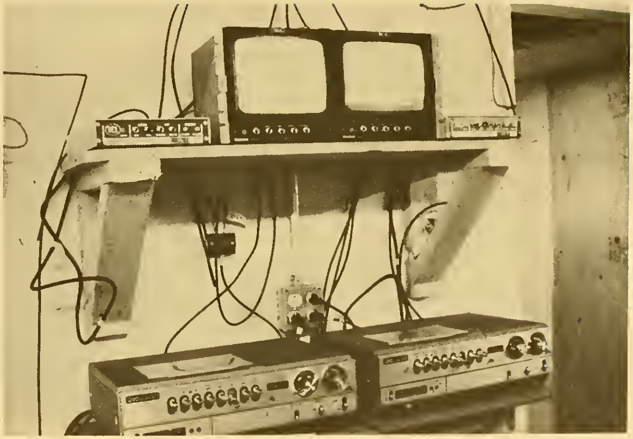

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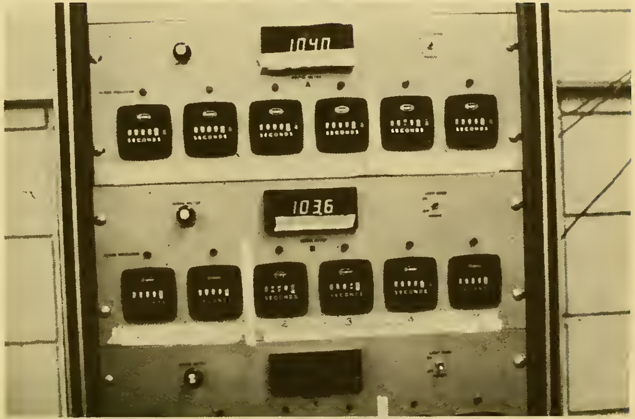

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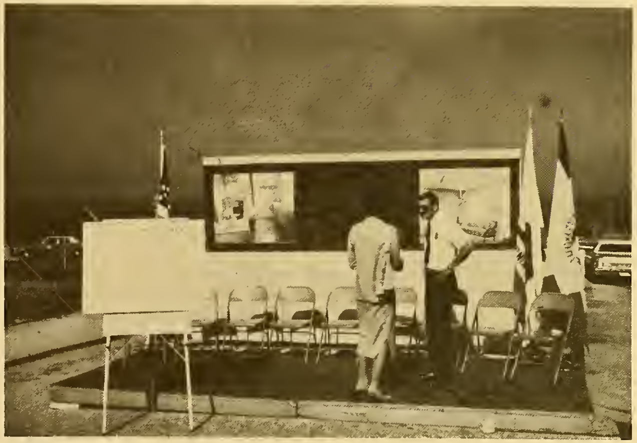

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When the dignitaries arrived, we directed them to the sign-in table (slides 39, 40). They got a handout packet and name tags to identify themselves. When the press arrived, we also assigned them a window view-port so they could shoot during the test. Chief Gerard served as MC during the program; we had representatives of California State, and representatives of the city, NFPA, Factory Mutual, U.S. Fire Administration - right across the line (slide 41).

Everybody showed up and we really appreciated the support. This is our local councilwoman who represented the city in this particular case and our test site is in her district (slide 42). I just had to put this shot in there for you with those palm trees (slide 43).

We had a good turnout, as you can see. The first thing we had was the ceremony in the street and then we asked the people to come in to view the test site and view, on closed circuit television, a full-scale test (slides 44, 45, 46).

This is a sampling of the sheets that are used for each test fire to cover all the bases during the countdown (slide 47). They are tied to a time frame so that you don't miss anything. Even with all this, we have had a couple of hiccoughs.

The clocks are installed like in back of the crew chief here. We have several of those around the test site and they all start and run simultaneously and they provide the information for the countdown. Here, Jim Pogue, the test house crew chief is going through his countdown sheet and coordinating with me in the control room exactly where they are (slide 48).

As they finish their phases, I merely check them off on my sheets.

One of the things we have to do is weigh the fuel load which it is consuming and measure the fuel load before and after the test. This slide is symbolic of that, weighing the fuel afterwards, couches and chairs and things like that, that was what was done (slide 49).

Part of each test is to certify each piece of equipment and again before each test every thermocouple is checked back to the computer; also, every sensing device is checked back as part of the countdown (slide 50).

We include an identifier on the video tape and just do it by a blackboard and chalk like this (slide 51). The 11/3 would indicate that's the third time we are going to attempt scenario or sequence 11. Now, either the fire went out or for some reason we didn't get data on a particular channel.

But after reviewing all the facts, if it did not appear accurate, we would redo that sequence.

Remember, we are still in the press conference phase and the people in the press conference had the opportunity to view just a living room fire such as you're going to see here.

Now, what may appear to be a picture right behind a chair is really one of the metal framed wire glass view-ports and that's an individual back there that can see the fire and he talks on an intercom system describing what he sees and that is impressed on the video tape (slide 52).

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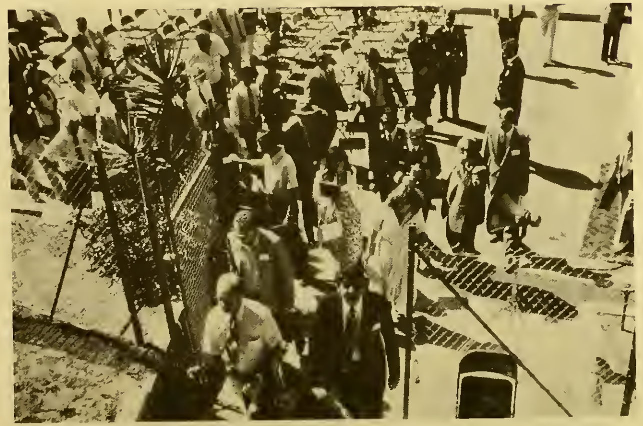

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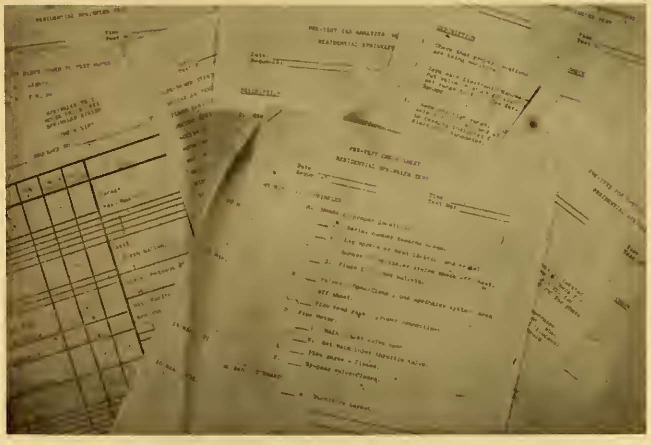

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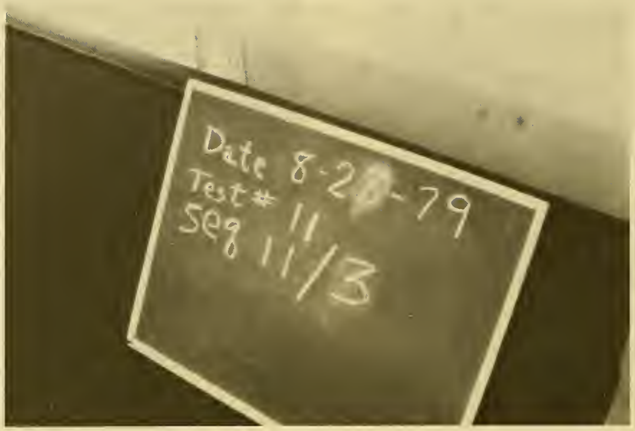

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So when you see the video tape later, you also hear all of the comments of all the observers.

All of our fires are nonaccelerated. This particular one was duplicated like this because it resembles Factory Mutual's fire, very similar to one we did in the detector test. They had a candle as a start. We used a waste basket and we didn't feel it compromised the results (slide 53).

You can see the smoke beam on the left here and see the light shining to the receiving unit and the density of the smoke. As of yet, the sprinkler head has not gone off (slide 54).

At this point it has and it's starting to push the fire back. But as you can tell, we do continue to get a build-up of smoke or optical density (slides 55, 56).

Now, at the instant that the sprinkler head operates in the command room, they adjust the throttle valves so the exact amount of water for that density is flowing, and that's monitored through the whole time (slide 57). If a second or third head operates, that valve is readjusted. That has been very carefully calibrated; it's readjusted to the new flow level using 0.08 and 0.06.

Again, you can see the fire continuing to be pushed back behind the chair, and eventually it would extinguish it (slides 58, 59).

On a smoldering fire like this, once the sprinkler system operated, we would let the sprinkler head operate for at least twenty minutes (slide 60). People from the press conference then had the opportunity to watch all of this on video. We had such a crowd we had to go to two levels in the house; we had to set up monitors in two levels to handle the people (slides 61, 62).

I might point out that we had every TV channel in Los Angeles that day. It was a fantastic response. When you invite the press like that, you worry about any other type of disaster happening, because you have an empty show if it does. So you schedule it in the morning because that's their lowest time of activity, and we were very, very fortunate on that day.

After the show on video, then several of the TV stations did individual interviews with Chief Gerard, which were aired that evening (slide 63).

There is a local film company that's making a 16-millimeter film of the test program (slide 64). They are called Area 16 Productions and this is what they are doing here. Now, whenever they are doing the filming here like this, it is not an official test. We will stage it and set it up. But during an official test, nobody is allowed in the house. Once the man starts the fire, he exits, shuts the door, and that's it. Nobody can be back in to change the environment in any fashion.

I would like to share one other fire with you which was not done for the press conference day. This is the coffee maker fire (slide 65). We have found it to be a rather predictable fire. If you have seen any of the slides or anything we did on the detector test, that's why we carried it over into this one.

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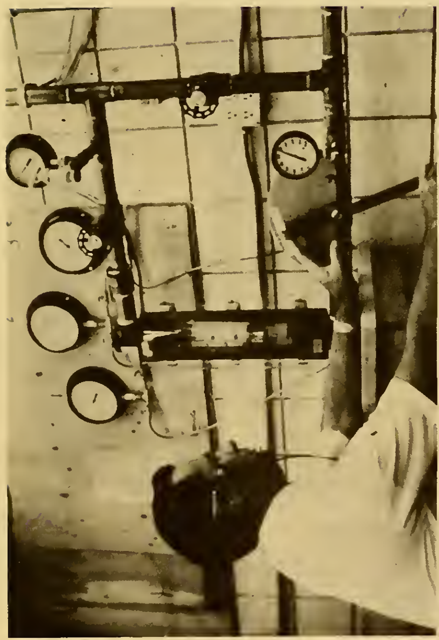

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The one thing that we do to the coffee maker is we bypass the thermal limit switch. Originally we got on our first test program several coffee makers that were a problem and they had been recalled for that problem. Now we cheat a little bit but that's all we do to them.

You can see this is about three minutes into the test. We are already getting smoke out (slide 66). I want to emphasize to you that never have we had the circuit breaker pop. The unit just does what it's designed to do, that is, it continues to heat. You can see the power is still on to the unit. Once the power does not become a factor in it, we do externally kill the power, but that's only after it's so far downstream. You can still see the juice is on here, and still here (slides 67, 68).

If we shut it off here, the fire would sustain itself.

You get some of this up and down in these particular fires a little bit when it topples or the fuel changes a little bit (slide 69). The fire will die down for a little bit, but then it comes back pretty good (slide 71). We get open flame in something around six minutes after we turn it on and the unit will burn up to this point for about seventeen to eighteen minutes, if we did not have a sprinkler system.

At this point, the sprinkler system has just operated and we are starting to get a little bit of suppression activity on it. And then bringing it back down. And that's the amount of damage (slides 72, 73, 74, 75).

Mentally, all you have to do is take that thing, without the sprinkler head having activated, on to the next step and we would have had the kitchen involved in moments. It's almost like a magic wand when that sprinkler head goes on; it's right out, a matter of seconds in some cases.

This is the sprinkler head that we are using in the test program. It's the one manufactured by Grinnell, as you saw earlier (slide 76).

That's the picture of the two, side by side, fused head and unfused (slide 77).

To date, we have completed a total of twenty tests. We have scheduled thirty in this phase. Nine of them have been smoldering and eleven of them have been flaming starts - a fairly even balance. There is one fire I think I did not have slides for that I would like to share with you. Predictably, from our detector test program, we found the closet fire to be the most dangerous killing fire that we did, including gasoline.

We did it again in this program. Only the scenarios were set up so in one case there would be a sprinkler head in the closet that would activate and one case there would not. But there would be two sprinkler heads in the bedroom, two in the hallway and two in the adjoining bedroom.

To make it a worse case situation, this is a totally ventilated fire as bedroom windows and doors were open. It's our worst situation. Being one to go a little bit for the showy, on Monday a week ago, the Society of Fire Protection Engineers in Los Angeles held their meeting at the test site. So we went for the fire without the sprinkler head in the closet.

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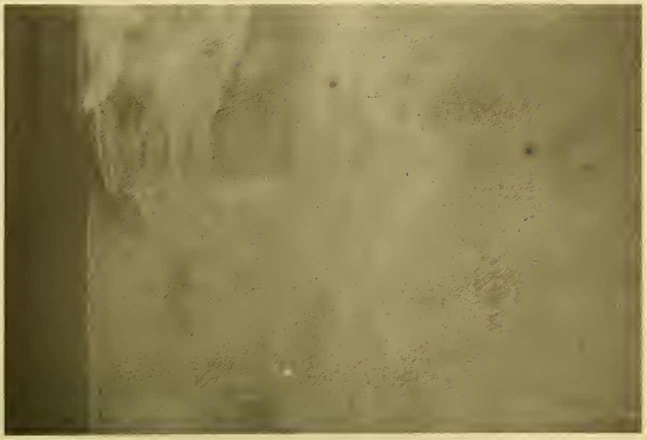

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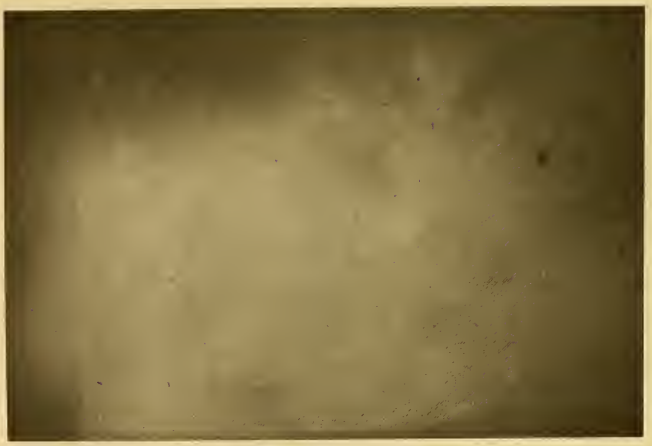

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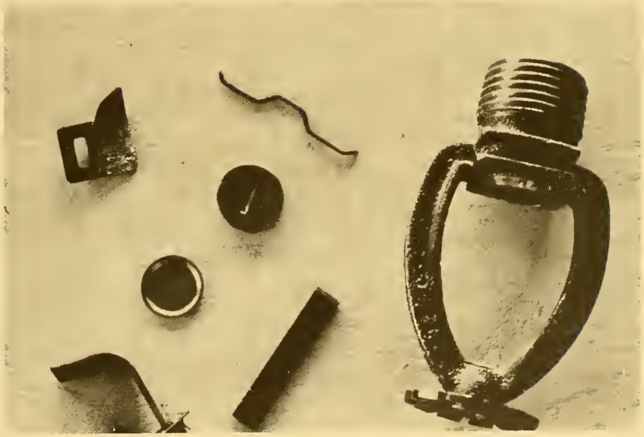


77.

We set up fifty pounds of cotton and polyester on hangers in the closet. We set up twenty pounds of shoes, fifteen pounds of bedding packages like that on the shelf. Not a large fuel load for that closet (slide 78).

We started the fire by putting a lit six-inch candle underneath the hanging garmets. The closet door is open 18 inches. In this particular case, we took the camera that looks normally down the stairway and put it so it looked into a view-port in back of the closet and we set the other camera looking straight across the room over the top of the bed, straight at the door (slide 78).

It was a dynamite fire. The closet temperature got over 1500 degrees. We eventually opened every sprinkler head on the second floor. And I thought it was going to get away from us. I had them have charged hose lines at the back and if you ever listen to the video tape, you can tell I'm a bit concerned because I could see through the wire glass on that one camera, I could see the heat and smoke coming through that glass and I could see the glass breaking.

I thought we were going to have fire right in the room with the camera and we would lose it. But that did not happen. The fire burned until it burned up its fuel in the closet. It's a very hot fire, and it developed some very high temperatures in the bedroom.

We rebuilt the house and came back and did that fire with the sprinkler head in the closet, everything else as identical as we could make it. In that particular case, the temperature at the five foot level of the bedroom elevated 7 degrees. One head operated, the one in the closet, and we burned about three garments.

The temperature for a moment raised up to about 290 degrees in the closet and then died down and it was over in a matter of moments. It was dramatically different from our standpoint.

There are a lot of things that have to be evaluated. I hope you don't take that as a blanket or anything, but it was very dramatic to us the difference between the two.

As I mentioned, we have completed twenty of our tests. We have ten yet to do under this phase. Seven of the ten have been tentatively identified. We are hoping we can work these in to satisfy any of the needs that 13D has.

Three tests are yet to be identified. I am hoping that within these three, if not, one following, we will do a garage fire. We have a double car garage set up with sprinkler heads. We would like to put two cars in the garage with a normal bunch of trash and junk that people have in their garages and have it ignited by a water heater.

We did this before in the detector test without the cars and we got a pretty good fire. We dislodged a gallon and a half of gasoline off the shelf that the water heater ignited the gas in about a minute and a half, and we had a fire.

Of course, in that type of thing you have a rapid fire; it eats up all the oxygen, dies down and heats slowly back up. We would like it with two automobiles, and it would be a very challenging, very shielded fire (slide 79).

Thank you.

79.

78.

DR. BERLIN: Don, I'd like to add one final closing remark. I'd like to introduce Chief Gerard, who is Chairman of our Executive Committee, and, besides his role in that respect, I think he has brought to the committee a very important perspective of the fire service.

The development and widespread installation of sprinkler systems is going to have a profound effect on the fire service in the very near future and I think that his concern with the benefits of it has been an important part of our program.

Chief, would you stand up. And I'd like to point to the fact that he will be chairing a session very appropriately on where we are going to go in the future with such technology. Thank you.

DR. BRYAN: (Moderator) We have some time for some questions, so, Jack, Geoff, if you'd come back up here with Chief Manning, please. We will take questions using the center mike, give your name and affiliation, and you can indicate if you have a preference for either one of the speakers to answer.

DR. BERLIN: May I bring up Dr. Kung, who was an integral part of this program. He wasn't featured in the presentation because we were trying to describe the program. But he is an integral part of the activity.

DR. BRYAN: (Moderator) Dr. Kung from Factory Mutual. Okay, I think they are ready to field your questions.

MR. GEORGE WEBSTER: (Kensington, Maryland) Montgomery County pioneered mandatory smoke detectors for every single home, whether it's rented, occupied, leased, sold or bought over four years ago.

My question is this. Grinnell, in the early 1970s, filed for a patent on the electronic squib quick activator, thirty second, instead of the two minute UL test maximum time for triggering the 165 sprinkler head.

Four years later, the U.S. government granted the patent and I have not heard mention whether that Grinnell electronic rapid action squib, which is a retrofit add-on to their Duraspeed with the copper cone in there, whether that's been used in any of these tests.

And also where a great number of my horse friends have moved to rural areas since horses aren't allowed in downtown or intown suburban areas, most of those people, both the very rich and the very poor, are on rural, well-limited water supplies. How is it that no one is working to make any tests with either Viking Varicycle or Grinnell's Aquamatic, which will not leave them with the farm house or barn that is flooded with all the water their well can produce until it runs dry on the millions of people who are moving to rural well-limited supplies on little teeny half horsepower water submersible pumps?

DR. BRYAN: (Moderator) Two questions, one about the Grinnell squib operated and one about horses. So who is the expert here?

CHIEF MANNING: I'm not sure that any of us here are particularly capable of answering the question. We in our tests have addressed some of the water needs, like in many of the cases we would limit the amount of water to 320 gallons and then we would shut off the sprinkler system.

We would then take the item, like a chair or a couch, outside and see if it would reignite without overhauling. That quite often would occur in something around thirty minutes after we would remove it from the house, reignition of that item would start.

DR. BRYAN: (Moderator) Dr. Kung, did Factory Mutual in their tests at Norwood work at all with the squib-operated head?

DR. KUNG: We have not tested response time of the Grinnell special sprinkler. But if they submit it to us, we can compare its response time with the prototype for residential use. So I imagine it will be verified fast.

DR. BRYAN: (Moderator) So your answer on the head is so far in neither the FM test or the LA test. Has the Grinnell squib-operated head been used?

MR. EARL G. PAGE: President of Grinnell. Maybe I can help.

MR. WEBSTER: It was nice of you to come.

MR. PAGE: It's a matter of economics. The squib probably would be as fast as the small head that we use, but economically would probably be nonfeasible. It's a much more expensive item.

MR. WEBSTER: Joe Hill told me four to five times the regular sprinkler head cost.

MR. PAGE: I would say many times more than that, perhaps ten times.

MR. WEBSTER: What's the estimated production cost of this new wafer disc unit?

MR. PAGE: We have not determined that yet.

DR. BRYAN: (Moderator) Do you have any other questions?

MR. WEBSTER: No. Dr. Bryan, I just want to thank Chief Manning for the very thoroughly instrumented tests. I can think of nothing they overlooked in the very thorough series of Los Angeles tests except that not everyone lives on a municipal water supply. Many people are on these little $300 submersible pumps with limited gallons per minute and no storage tanks to speak of past 42 gallons.

Thank you.

DR. BRYAN: (Moderator) Thank you. Mr. Rand.

PROFESSOR RICHARD S. RAND: (New Hampshire Department of Technical Colleges) I am one of those unfortunate or fortunate individuals you might say who already has a sprinkler system in his house and I also live in a rural area. I do have water; it works well in Jack Daniels.

But to be real serious, I would like to have the committee, in developing standards, set up a criteria of what would be considered a minimum limited water supply very similar to what we use in NFPA 13 for a conventional system.

I presently have a 150-gallon pressure tank which I think might - I'm not going to burn the house down to try it, I'll tell you that - but I really think you should have something in the standards for residential sprinkler systems to reinforce this gentleman's question over here that preceded me in terms of what would be adequate because we do have a lot of people going to the rural areas; I'll attest to that.

Thank you.

DR. BRYAN: (Moderator) Any other questions or comments?

MR. SABHLOK: I spoke earlier. I was somewhat not clear on whether or not you're planning to study the horizontal distance between the ignition point or source and the location of the sprinkler head in terms of its distances since we know the ceiling height to be a fixed, not a variable; the only other variable would be horizontal distances.

And I'm sort of curious as to what your program intends to do in that area.

DR. KUNG: At Factory Mutual, we have changed ignition location in our test series, so we did study that variable in a test program. And I think in the Los Angeles fire test program, they also changed ignition location in several of the test series.

And also they intend to change the ceiling height in their test program.

DR. BRYAN: (Moderator) Mr. Friedman.

MR. FRIEDMAN: (A.C. McDonald) We are fire protection contractors. I'd like a little further definition of the closet test that you described, the first one where there was no sprinkler. You said all of the sprinkler heads on the second floor activated. What kind of closet was it?

There was no burn through to the space above? What contained the fire in the closet that was so well developed?

CHIEF MANNING: There were two heads in the bedroom of which the closet was part: two in the hallway and two in the adjoining bedroom across the hall. The reason that it did not burn out is that we had put dry wall in the closet and lined it with the half-inch dry wall prior to the detector tests and the dry wall held.

It was a closet slightly over twenty-four square feet in size and it is a walk-in type of closet. The garments were on one side only as you would walk in, on the left side, and they had a shelf above the garments and then a shelf across the back and then a shelf down the other side.

But the only side principally involved would be the west side of the closet.

MR. FRIEDMAN: Do Los Angeles building codes require that all ceiling spaces be so constructed?

CHIEF MANNING: No. We had gone beyond this. It was what we felt originally to be; it would be nonconforming by today's standards, so we brought it to a conforming situation by today's standards. Originally, it was very thin plaster over wood lath, and the wood lath failed.

MR. TRAW: (ICBO) Chief Manning, is there any attempt to have a scenario using the combustible attic space?

CHIEF MANNING: None is proposed.

MR. TRAW: Or the furnace compartment?

CHIEF MANNING: No.

MR. JOHN J. CHENEY: I own a small fire protection contracting firm called Fire Protection Engineering, doing business in the Boston area. A couple of questions on the water supply.

What was the size of the supply from the street main to the manifold?

CHIEF MANNING: That is a one-inch meter service and the pipe that comes on the house side from there is an inch and a half.

MR. CHENEY: And then the size from the manifold to each one of the heads was what?

CHIEF MANNING: Inch and a quarter. But they were hydraulically balanced to each other so that changed; every leg was hydraulically balanced to every other leg, so depending on the run those shorter would be sized down to an inch, those that were on long runs would remain at an inch and a quarter.

MR. CHENEY: And water supply from the street supply was the normal six-inch underground main you might find in residential areas?

CHIEF MANNING: That's correct.

DR. KUNG: I would like to add to Chief Manning's comment. That system is designed for the experimental purpose. If you would like to design a system for your own house or to do something for your clients, I think a one and three-quarter inch piping will be sufficient.

MR. CHENEY: How about the supply from the street?

DR. KUNG: Supply from street, I would recommend an inch. Depends on the distance between your supply from the street and also water pressure, three-quarter inch or inch. You have to do your engineering work there.

MR. CHENEY: As far as you can tell at the moment, the average home in the greater Boston area is lucky to have a three-quarter inch or one-inch supply.

DR. KUNG: It also depends on the distance between the road and house. In Newton, maybe you can get away with three-quarter. In Weston, you may need a one inch.

MR. CHENEY: They can afford it in Weston.

CHIEF MANNING: I might add that there was no attempt to make this sprinkler installation resemble what you would install in your home. Obviously, you wouldn't have all the valves and that sort of thing.

So the intent was to control the water, the exact amount, not by pipe size, but by the throttle valve and measuring it through the flow meter.

MR. JIM GRILEY: (Navy Facilities Engineering Command) Can you give us some information on the head, droplet size of the water coming out of the head. I believe Factory Mutual was doing some work on a mist-type, high pressure-type head.

Can you tell us if there's any more work in that area.

DR. KUNG: For this phase of the work, our objective is to use the low pressure domestic water supplies. So we emphasize the sensitivity of the link and the distribution. Of course, on rural application, at that time we will get into the drop size effect and try to develop a system which will use much less water and so the water can supply adequate amount.

DR. BRYAN: (Moderator) At this time, I'd like you to join me in a round of applause for the panel and all the speakers.

Thank you, gentlemen.

SESSION II - IMPLEMENTATION

Dr. John W. Lyons

Director, National Engineering Laboratory

National Bureau of Standards

Moderator

Gentlemen, please be seated. I'm John Lyons, member of the NFPA Board of Directors, and an employee of the National Bureau of Standards with some familiarity with the fire problem in the past. And I'm your moderator for this afternoon's session, which is open-ended, except there's important business at six o'clock and I imagine some people might want to make a transition somewhat before that.

Now, this morning we talked about technology and you heard about experiments and tests and the like. This afternoon we are going to shift gears and consider what happens to that information from many perspectives.

We are going to have two talks, one from the point of view of the Technical Committee, NFPA Technical Committee; Rolf Jensen will do that one. And then from the point of view of the certifier; Tom Castino will be talking about how Underwriters Laboratories thinks about this and how it needs to proceed.

We are not going to have fancy introductions; this is an in-group, everybody knows each other. So I'm going to do one thing. I'm going to try to keep the proceedings on time and I have asked each speaker to stop at least five minutes short of his deadline so we can have a question and answer period.

Of course, we built into the proceedings a discussion panel, the whole purpose of which is to flush out and air all of the questions and issues that this subject matter presents.

Without further notice, we will begin with the discussion of the development of NFPA 13D, Residential Sprinkler Standard, and Rolf Jensen.

DEVELOPMENT OF THE NFPA 13D RESIDENTIAL SPRINKLER STANDARD

Rolf H. Jensen

President

Rolf Jensen & Associates, Inc.

Thank you, John. I'd like to digress from the subject matter of my talk for just a couple of minutes at the outset. Many of you are aware of the fact that Chet Schirmer is unable to be here at this meeting and a lot of you have asked me in passing from time to time through the meeting of how he is and how things are going.

Among other things, Chet and I fight a lot, but we really are pretty close friends. Chet had a heart attack five weeks ago last Saturday. It was in the lower left side of his heart. It was mild as heart attacks go and the definition of that, I am told by his doctor, is that he survived.

He is coming along fine. He lost about twenty pounds since the heart attack. And those of you who knew him before won't recognize him now. In fact, he almost looks sexier than Peggy at this stage of the game, and that's not easy.

He started back to work on Monday on a reduced schedule, and I am told that his first outing will be at the Sprinkler Committee meeting on October 5. I know you have all been signing the card and I'm sure he will greatly appreciate your good wishes.

I couldn't help but react to something that I heard, I think, twice this morning, and I may not have gotten the numbers right because numbers have always confused me. But I think both Harry Shaw and Jack Rhodes said something about 300,000 people per year end up with some kind of emotional disturbance as a result of the residential fire problem.

I hate to tell you this, but a large percentage of them are on the 13 and 13D committee.

For some reason, I always get stuck with giving my talks right after lunch. I think this is because a lot of my good friends know that I'm an ex-college professor and ex-college professors have one great characteristic, they talk very well on other people's sleep. Think about it.

Okay, the third thing I have to get out of the way before I get serious is that Ken Backman ran up to me before lunch and he said, "Rolf, where are your slides?" I said, "I don't have any." He said, "Boy, you're going to have to get off the program." So I said, "I'll get one."

Ken, will you put on my one slide? It's clean. This is called progress in case you're wondering. That's enough for the slides.

As far as I am concerned, the residential sprinkler program started in September, 1971, when we were faced with designing protective systems for a large multi-story complex in Chicago which included a substantial segment of condominiums. One of the approaches we tried was to apply a special fast response sprinkler developed by Grinnell Corporation. Ultimately we never did use that sprinkler, but at least it was a start on the path to solving the residential sprinkler system design problem.

The second step occurred in June, 1973, when Chet Schirmer and I had a meeting to discuss how NFPA 13 might face up to the residential fire problem. From that meeting came the creation of the Residential and Light Hazard Subcommittee and ultimately the development of NFPA 13D. Let me emphasize the correct name of this subcommittee, since many people simply refer to it as the 13D Subcommittee or the One- and Two-Family Dwelling Subcommittee which, of course, is not correct. The scope of the committee encompasses considerably more than dwellings.

Before the first edition of 13D was published in 1976 (even though it is dated 1975), there were about five committee drafts, most of which did not get outside the committee or subcommittee. For example, the first draft covered all residential occupancies including apartment houses, high-rise hotels and apartments, multi-family dwellings. It did not get out of the subcommittee. The next edition cut the standard back to a limit of three stories or fifty feet and would have encompassed mobile homes, one- and two-family dwellings and multi-family housing. Once again, it never got out of the subcommittee.

After several additional tries, the draft evolved to One- and Two-Family Dwellings and Mobile Homes. This was first proposed for adoption at the May, 1975 meeting in Chicago. The most important rationale for 13D developed from an inherent recognition of the record of industrial sprinkler systems (exactly the data that Jack Rhodes showed this morning), a record of roughly ninety percent reduction in losses.

There was also a recognition that, while NFPA 13 produced a very good system, it was too expensive. We were likely to sell as many NFPA 13 sprinkler systems to homeowners as we were going to sell refrigerators to Eskimoes. Well, maybe not quite as many because it gets warm in Alaska. Why not? We think because homeowners do not recognize the fire problem. This was later proven in a survey by Jensen and Schirmer conducted for NFPCA which showed thirty percent of the people did not perceive a fire problem (see figures 1 and 2). From the beginning this was a major recognition on the 13D Subcommittee. As a result, we felt that we had to have the minimum cost solution.

We set a goal of a $1000 system for a 2000-square foot home, in a new installation, and found that such a system is achievable with current technology. It is achievable, in fact, with NFPA 13D. It is not achievable in every 2000-square foot home -- new or existing.

From the beginning, the committee felt that a full scale NFPA 13 light hazard system would handle any residential fire within reason. However, such a system calls for sprinklers to be installed in closets, basements, bathrooms, etc. -- every area of the home. Further, it requires a minimum 250 gpm water supply and a design density of 0.1 gpm per square foot over 1500 square feet. It's a good system; it covers the waterfront. It is also too expensive and we can't sell it to a homeowner. Now if you want to legislate a solution, you can legislate that home sprinkler systems be installed in accordance with NFPA 13 or any other solution you may want to dream up. However, if you want to achieve a low cost solution in order to entice people to install sprinklers, then you must get the cost down, and cost reduction is a difficult problem.

Let me turn now to a few of the key points of NFPA 13D-1975 as it exists today and review how and why the system as designed in the standard developed. Insofar as where it is headed, the emphasis will clearly be on further cost reduction.

Figure 3 comes from the appendix of NFPA 13D, paragraph A-1-1. The standard recommends, but does not require, sprinklers in all areas of a dwelling. It permits sprinklers to be omitted in certain areas which are the areas shown by NFPA statistics to be those with a low incidence of life loss from fires in dwellings. You can argue the validity of any one of these omissions. However, as you install sprinklers in more and more areas, the cost will increase. Figure 4 shows the current standard assumes the use of half-inch nominal orifice diameter sprinklers in most systems and that in most fires only one sprinkler will operate. Later test work has suggested this may be questionable, but we will return to that later.

Why? With a mandated alarm, if we haven't awakened people and accomplished their egress in ten minutes, we have not met the life safety goal. Further, at a density of 0.1 gpm per square foot and 256 square foot maximum spacing, the system water flow rate is 25.6 gpm, and a 275 gallon "oil tank" is a ten-minute duration supply. The tank costs about $25, i.e., a very simple, inexpensive water supply. An inexpensive pump is needed.

The density of 0.1 gpm per square foot and the area of coverage evolved from a few "ad hoc" tests at the Grinnell Corporation and Underwriters Laboratories during 1973 and 1974. These tests were in a 256-square foot room and involved fires with an approximation of an overstuffed chair, a crib, a drapery/chair fire, and a wastebasket/drapery/chair fire. It was possible to extinguish these fires with sidewall and overhead sprinklers while maintaining control of temperature, oxygen and carbon monoxide content to an acceptable level.

Note that the selected design density is the same as NFPA 13-light hazard. It was also recognized at that time that the Australian sprinkler standard recognized a density of 0.065 gpm per square foot (U.S.) for extra light hazard occupancies and which had produced a highly successful fire extinguishment record. Later tests by Factory Mutual and Battelle showed acceptable results with densities of 0.06 gpm per square foot or lower. Note also that the Australian standards require an alarm tied into the fire department.

NFPA 13 has extensive requirements for pipe hanging; NFPA 13D says "hang sprinkler pipe like the plumbing system." This is a major cost differential.

NFPA 13 says you must hydrostatically test the piping system at 200 psi or 50 psi above the maximum service pressure.. NFPA 13D says "turn the water on. If it leaks, turn it off and fix it." Thus you save approximately $400 on a hydrostatic test.

NFPA 13D calls for Listed sprinklers (UL/FM). All other equipment may be common plumbing equipment, including a commercial pump and commercial valves. If it works in the plumbing system, it ought to work on the sprinkler system.

In most communities a 5/8-inch water meter serves the residents. These have poor friction loss features (28 psi at 25 gpm). A three/quarter-inch meter lowers the friction loss but at a cost of roughly $200. To overcome this, we must either lower meter costs or friction loss or eliminate meters.

Finally, NFPA 13D allows sprinklers to be omitted from certain areas to save on installation cost. (See Figure 5.) These rules will change in the next edition of NFPA 13D primarily because the risk of an omission changes between dwellings and multi-family housing, both of which will be encompassed in the next edition. In each case, the omission of sprinklers was based on consideration of where the fires were happening and how much we could reduce installation costs.

Remember, the existing NFPA 13D-1975 was developed with almost no data. After it was published, the NFPCA (now the U.S. Fire Administration) picked up the charge by funding an extensive research and test program to determine how to get better low cost suppression systems and to evaluate what influenced people to buy such systems. This data was eventually given to the NFPA 13D Committee in the early part of 1978. A study of the data revealed that the preponderance of the tests by Factory Mutual and Battelle Laboratories were on smoldering fires with only minimal flaming fires and no ventilated conditions. So the committee asked USFA if the data gaps could be filled with additional tests at Factory Mutual. This led to a series of room fire tests in ventilated bedrooms, unventilated bedrooms, a small mobile home bedroom, and in ventilated and unventilated living rooms. Test 4 was a ventilated flaming fire in a living room at a density of 0.06 gpm with two sprinklers operating, and we did not extinguish the fire. Prior to that test all of the other fires had been extinguished with 0.06 gpm per square foot in a 12-gpm, two-sprinkler system. A 12-gpm system is a low friction loss system through the meter, and that lowers the cost extensively.

Subsequently, additional tests were done with a fast response sprinkler, and as we now stand, it appears that the most likely solution will require a 27-gpm total flow on the system or 32-gpm flow when we have combined sprinkler domestic piping. This unfortunately is too much water and too expensive. Thus, our research continues in the quest of a low cost reliable system.

During the course of the program, we have experienced some failures testing on this flaming fire ventilated living room condition at an application rate of 0.10 gpm per square foot when the sprinklers were current commercial production installed in a 256 square foot spacing. Some concern has been expressed about these test results because they would appear to parallel the requirements of the current NFPA 13D and the light hazard requirements of NFPA 13. The fact that we did not extinguish these test fires has suggested to some people that we discontinue the current 13D or change the light hazard requirements in NFPA 13. Remember, however, that when a sprinkler system is designed at 0.1 gpm per square foot and 1500 square foot coverage, the first sprinkler operates at a density of 0.15 or 0.2 gpm per square foot or higher, depending upon the hydraulics of the system. Also remember that the unventilated flaming living room fire scenario may well be a fire condition which is atypically severe for a residence. Regardless, the test program to validate the exact minimum density, area of coverage, and water flow requirements that will be in the next revision of NFPA 13D is continuing.

FIGURE I

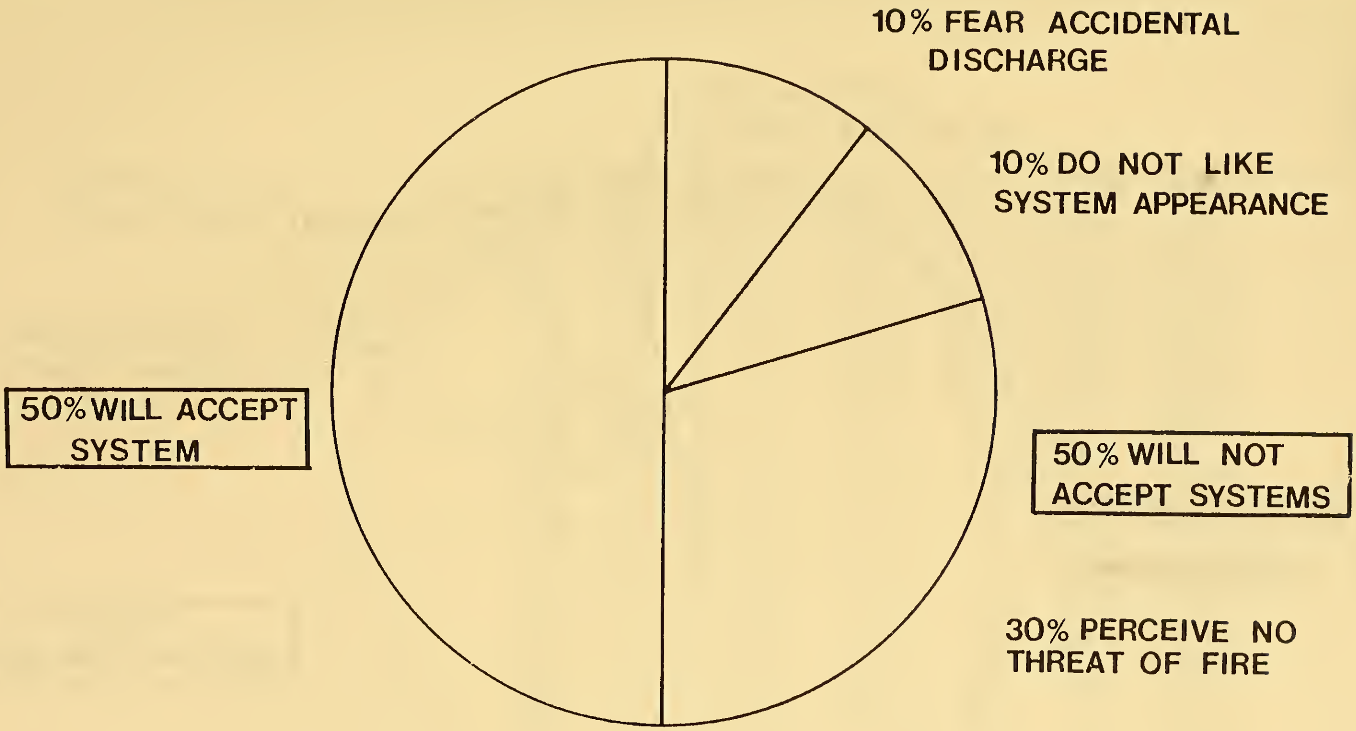

10% FEAR ACCIDENTAL DISCHARGE
10% DO NOT LIKE SYSTEM APPEARANCE
50% WILL NOT ACCEPT SYSTEMS
30% PERCEIVE NO THREAT OF FIRE
50% WILL ACCEPT SYSTEM

FIGURE 2

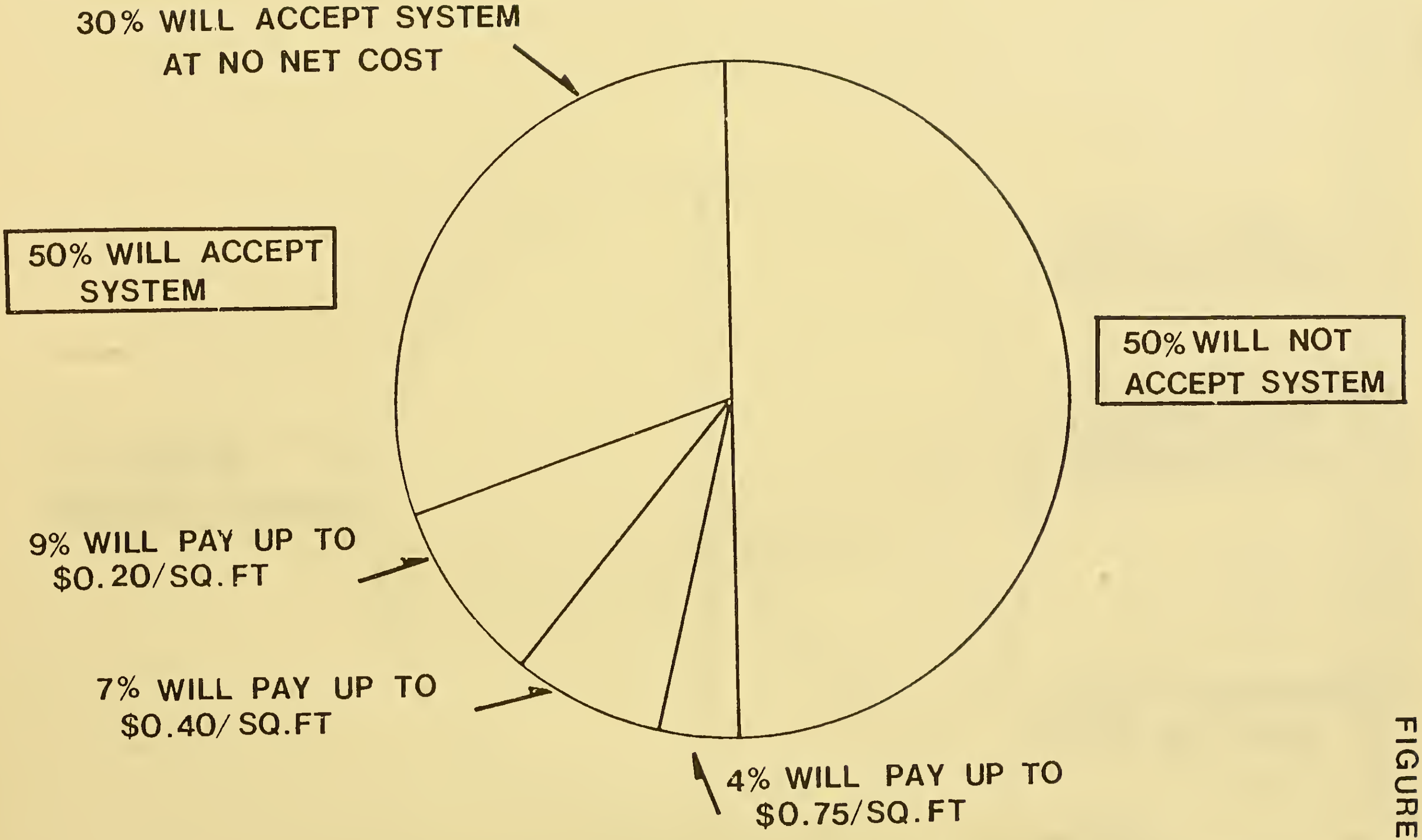

30% WILL ACCEPT SYSTEM AT NO NET COST
50% WILL ACCEPT SYSTEM
9% WILL PAY UP TO $0.20/SQ.FT
7% WILL PAY UP TO $0.40/SQ.FT
4% WILL PAY UP TO $0.75/SQ.FT
50% WILL NOT ACCEPT SYSTEM

FIGURE 3

A-1-1 LEVELS OF PROTECTION. VARIOUS LEVELS OF FIRE SAFETY ARE AVAILABLE TO DWELLING OCCUPANTS TO PROVIDE LIFE SAFETY AND PROPERTY PROTECTION. IN ORDER OF DESCENDING DEGREE OF PROTECTION, THESE ARE:

(A) INSTALLATION OF A SPRINKLER SYSTEM WITH SPRINKLERS IN ALL AREAS INCLUDING BATHROOMS, CLOSETS, ATTICS, AND ATTACHED STRUCTURES PLUS A SMOKE DETECTOR IN THE HALLWAY OUTSIDE ALL SLEEPING AREAS.

(B) INSTALLATION OF A SPRINKLER SYSTEM WITH SPRINKLERS IN ALL AREAS INCLUDING BATHROOMS, CLOSETS, ATTICS AND ATTACHED STRUCTURES.

(C) INSTALLATION OF A SPRINKLER SYSTEM WITH SPRINKLERS TOTALLY OR PARTLY OMITTED IN BATHROOMS, CLOSETS, ATTICS AND ATTACHED STRUCTURES AND WITH FIRE DETECTORS IN ALL AREAS WHERE SPRINKLERS ARE OMITTED.

(D) INSTALLATION OF A SPRINKLER SYSTEM WITH SPRINKLERS TOTALLY OR PARTLY OMITTED IN BATHROOMS, CLOSETS, ATTICS AND ATTACHED STRUCTURES AND WITH A SMOKE DETECTOR IN THE HALLWAY OUTSIDE ALL SLEEPING AREAS.

(E) INSTALLATION OF A SPRINKLER SYSTEM WITH SPRINKLERS TOTALLY OR PARTLY OMITTED IN BATHROOMS, CLOSETS, ATTICS AND ATTACHED STRUCTURES.

GUIDANCE ON INSTALLATION OF SMOKE DETECTORS AND FIRE DETECTORS MAY BE FOUND IN NFPA NO. 74 (SEE APPENDIX B).

FIGURE 4

A-1 EXPLANATORY. THIS STANDARD ASSUMES THAT IN MOST SYSTEMS SPRINKLERS HAVING NOMINAL ORIFICE DIAMETER OF ONE-HALF INCH WILL BE USED AND THAT, IN MOST FIRES, ONLY ONE SPRINKLER WILL OPERATE. THE SYSTEM CONTEMPLATES A BASIC DENSITY OF 0.10 GALLONS PER MINUTE PER SQUARE FOOT OR AN APPROXIMATE RATE OF TWENTY-FIVE GALLONS PER MINUTE FOR A DURATION OF TEN MINUTES. THE TOTAL WATER SUPPLY, IF STORED ON PREMISES, IS AT LEAST 250 GALLONS.

FIGURE 5

3-3.4.1*	SPRINKLERS SHALL BE INSTALLED IN ALL AREAS.
EXCEPTION NO. 1:	SPRINKLERS MAY BE OMITTED FROM BATHROOMS NOT EXCEEDING FORTY SQUARE FEET.
EXCEPTION NO. 2:	SPRINKLERS MAY BE OMITTED FROM SMALL CLOSETS WHERE THE LEAST DIMENSION DOES NOT EXCEED THREE FEET AND THE AREA DOES NOT EXCEED TWENTY-FOUR SQUARE FEET.
EXCEPTION NO. 3:	SPRINKLERS MAY BE OMITTED FROM OPEN ATTACHED PORCHES, CARPORTS, AND SIMILAR UNHEATED ATTACHED OPEN STRUCTURES.
EXCEPTION NO. 4:	SPRINKLERS MAY BE OMITTED FROM ATTICS WHICH ARE NOT USED OR INTENDED FOR LIVING PURPOSES OR STORAGE.
EXCEPTION NO. 5:	SPRINKLERS MAY BE OMITTED FROM ENTRANCE FOYERS WHICH ARE NOT THE ONLY MEANS OF EGRESS.

DR. LYONS: (Moderator) Thank you, Rolf. I think rather than take questions, we will go right on and listen to Tom Castino and use the panel discussion for the question and answer session. We are running a little late, Tom.

DEVELOPMENT OF THE NEW RESIDENTIAL SPRINKLER PRODUCT ACCEPTANCE STANDARD

G. Thomas Castino

Chief Engineer, Fire Protection Division

Underwriters Laboratories Inc.

I'll do the best I can. I understand that Rolf is going to give a quiz on this. I hope you were all taking notes. The United States Fire Administration is going to run the bar and you if answer the question right, you get a drink. Doesn't he seem like a professor. You remember they would be real happy, give you that whole long thing and say there will be an exam tomorrow.

INTRODUCTION:

In 1974, Underwriters Laboratories Inc. initiated an in-house research project to develop requirements for the investigation of a sprinkler head intended to reduce the risks of fire in the room of origin (Figure 1). The program involved conduct of nearly 200 fire tests in simulated living rooms employing simulated foam-stuffed furniture, curtains and other contents.

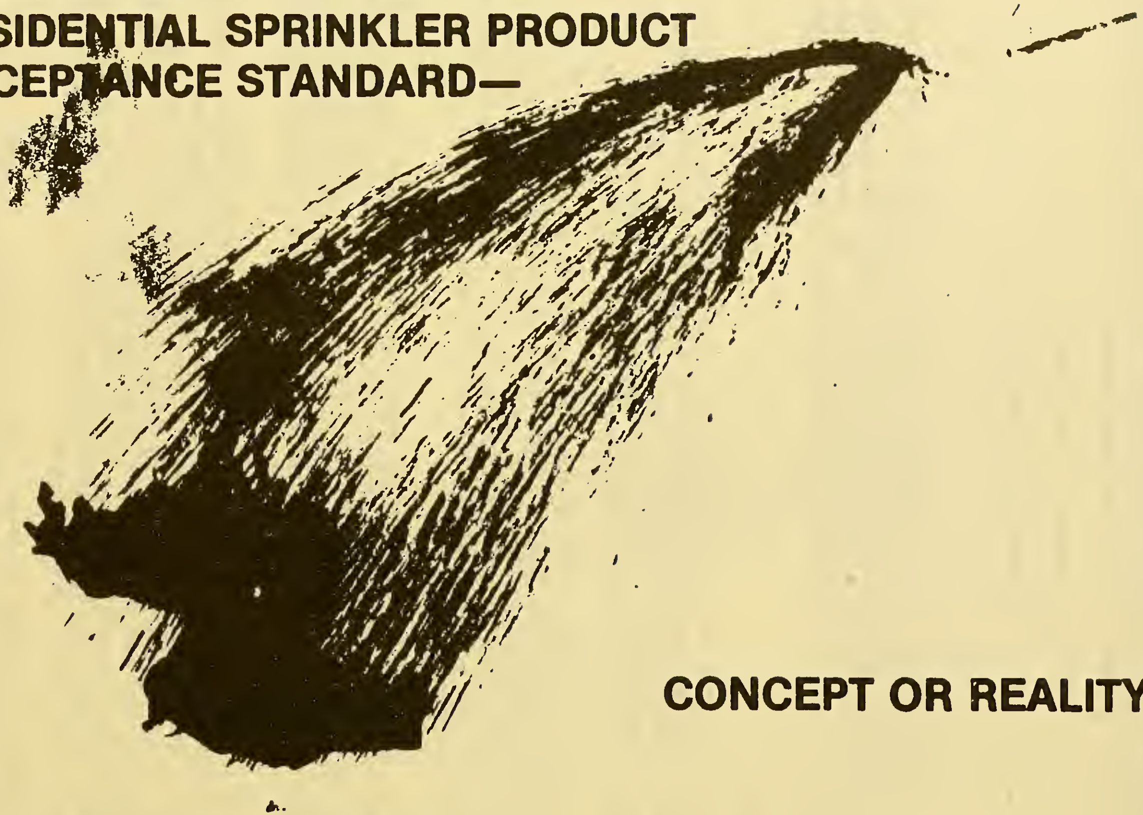
Following these tests, full-scale fire experiments were performed with various types of ignition sources to develop a reliable and reproducible fire source for evaluating sprinklers to be used in living areas, such as hotel rooms and nursing homes. It was determined that a properly sized, over-dried wood crib provided a reproducible fire source for use in evaluating fire suppression within enclosures.

One of the more important factors associated with the development of these test methods was the need to optimize repeatability. UL's experience with the burning characteristics and consumption rates of various ignition sources indicated that a moisture-controlled wood crib and a gas sand-burner provided repeatable fire sources, having an associated large body of support data upon which to draw.

An ad hoc committee, consisting of representatives from numerous interest groups including insurance, safety experts and consultants, government agencies, trade and nontrade associations, manufacturers, inspectors, and standards organizations, was formed by UL to assist in this early phase of the development of test methodology for a room-of-origin fire suppression sprinkler. Since extended coverage (EC) sprinklers were also under study at this point in time, they were factored into the program and proved to be an important aspect of UL's development work.

As a result, it became necessary that a parallel set of requirements be developed for the existing Automatic Sprinkler Standard, UL 199. Investigations were conducted, with the cooperation of sprinkler manufacturers, to develop performance requirements for EC sidewall sprinklers. The basic premise for this test development work was that EC sidewall sprinklers should perform at least as well as standard sprinklers installed in accordance with the requirements of the National Fire Protection Association (NFPA) Standard for the Installation of Sprinkler Systems, NFPA 13, and took into account the many years of satisfactory service provided by Listed sprinklers installed in accordance with the NFPA 13 Standard.

DEVELOPMENT OF THE NEW RESIDENTIAL SPRINKLER PRODUCT ACCEPTANCE STANDARD—



CONCEPT OR REALITY?

FIG. 1

In view of the course that this early evolutionary process took, UL proposed in March of 1979 that further work on the generation of a separate UL "special purpose" sprinkler standard, under the accredited organization method for ANSI recognition, be deferred pending: 1) a review of data generated by the U.S. Fire Administration (USFA) sponsored large-scale testing at Factory Mutual (FM) and City of Los Angeles Fire Department (LAFD) of residential sprinklers, and 2) the outcome of a USFA sponsored program, wherein UL and FM are developing a product acceptance standard for residential sprinklers.

EARLY RESIDENTIAL SPRINKLER RESEARCH TESTING:

The primary objectives of UL's residential sprinkler research testing were to:

1. Develop requirements for the investigation of sprinklers that reduce fire risks in the room-of-origin, by quick-response and suppression of the fire to limit the development of temperatures, toxic gases, smoke obscuration, oxygen depletion and related fire characteristics and,
2. Develop relevant sprinkler performance data for use by the NFPA 13 committee in the preparation of an installation standard for residential sprinkler systems.

Multiple series of fire tests were conducted in test rooms of various sizes. These fire tests employed various types of ignition sources, such as wood, paper, foam, alcohol, fabrics, etc., in varying amounts and located in several positions within the room.

After determining the type and amount of fuel that would produce temperatures in excess of a datum temperature of 150 degrees F at the five-and one-half-foot level of the test room, various sprinkler designs incorporating different activation systems, including fixed temperature links, thermostats, rate-of-rise detectors, and product-of-combustion detectors, were employed. Various water flow rates were also examined in these tests.

The test rooms were constructed with two three-by-seven-foot doors and an eight-foot ceiling. The walls consisted of four-foot wide modules bolted together and faced with asbestos-cement boards. Instrumentation in the room consisted of thermocouples located at: 1) the quarter points, 2) the center of the ceiling, and 3) the five-and-one-half-foot and three-foot levels above the floor. Thermocouples were placed at each of the sprinkler locations.

Copper tubing was installed in the room so that the open ends of the tubes were located at each thermocouple position. One set of tubes was employed to draw samples of gases through an instrument which monitored carbon monoxide (CO), and the values in parts-per-million were continuously recorded. The other set of tubes was used to draw samples of air through an instrument for monitoring oxygen content, and the values were continuously recorded on a chart. Finally, a smoke photometer was installed to monitor and record smoke optical density per linear foot (concentration).

All tests were repeated in room sizes of twelve by twelve feet, sixteen by sixteen feet, sixteen by twenty feet, and sixteen by twenty-eight feet. Ventilation (air changes) was primarily by natural convection through leakage around the doors.

The results from these nearly 200 fire tests, including smoke, CO, and oxygen depletion measurements, were carefully analyzed.

It was determined that, when materials used in mattresses and stuffed furniture were ignited by various sources, the vertical surfaces of the fabric covered cushions became fully and rapidly involved in fire, producing essentially complete light obscuration by smoke, along with high CO levels within short periods. Employing sensitive smoke detectors to activate the sprinklers did not significantly reduce the smoke or CO levels. When concealed surfaces were involved in fire, the water discharge from sprinklers appeared to have little effect on the burning of the material and suppression of combustion products.

The measurement of gas concentration and smoke was not included in UL's first draft of a Proposed Standard for Quick Response-Extended Coverage Sprinklers, primarily because values for the permissible limits of these gases, at various temperatures, over a range of exposures had not been established.

DEVELOPMENT OF TESTS FOR EXTENDED COVERAGE SPRINKLERS:

To a significant degree, the planning, testing techniques, statistical analyses of data and overall rationale behind UL's recent development of new requirements for extended coverage sidewall sprinklers can be applied to the development of test methodology and a product acceptance standard for residential sprinklers. At the very least, the testing experience gained will prove to be a useful adjunct to the research testing being carried out by Factory Mutual and the Los Angeles Fire Department under USFA sponsorship.

TEST PREMISE:

Investigations were conducted with the cooperation of the sprinkler manufacturers to improve performance requirements for extended coverage sidewall sprinklers. The basic premise for this next series of development tests was the EC sidewall sprinklers should perform at least as well as standard sprinklers installed in accordance with the requirements of the NFPA Standard for the Installation of Sprinkler Systems, NFPA 13. This work took into account the many years of satisfactory service provided by Listed and Approved sprinklers installed in accordance with the NFPA 13 standards.

Extended coverage sidewall sprinklers were, therefore, to be compared with 160 degrees F ordinary temperature rated sprinklers spaced on the fifteen feet by fifteen feet light hazard spacing with the link located nine inches down from the ceiling (approximately ten inches to the deflector). In keeping with the premise outlined herein, the slowest responding sprinkler was selected for this work. Initially, a fully enclosed room with an eight foot high ceiling was used. To eliminate the effects of uncontrolled, external drafts, this room was constructed within a larger room measuring nominally sixty feet square by sixteen feet in height.

RESPONSE TIME TESTING:

This initial work was conducted to establish an effective fire size. A one-cubic-foot steel box, open at the top, connected to a methane source, was filled with sand. By a trial process, an optimum fire size was determined that would provide repeatability of results. It has been observed that a fire generating low energy did not provide consistent operation times (i.e., thermal air currents became erratic); larger fires nulled-out the differences between operation times of both the control sprinklers and the test EC sidewall sprinklers.

After these initial tests, ninety sprinklers of the same type were subjected to this control test. A flow of methane gas of 340 standard cubic feet per hour was selected to initiate each test run when the ambient temperature, ten inches from the ceiling, was measured to be 87 ± 2 degrees F. Temperatures were determined by means of a thermocouple imbedded into a typical fusible element sprinkler link, silver soldered together.

The results of six similar runs, using fifteen sprinklers each, indicated a mean operation time of 3.1 minutes (3 min -6 sec.) normally distributed about the mean with a standard deviation of 0.198 min (approximately 12 sec).

In order to qualify for Listing at a specified spacing greater than the fifteen feet by fifteen feet standard spacing, EC sidewall sprinklers are required to be tested with the same fire and operate so that the slowest EC sidewall sprinkler does not operate any slower than the slowest of the control sprinklers, in ninety-nine percent of the cases. Slower response times were observed for sidewall sprinklers located four inches down as compared with sprinklers located greater distances down from the ceiling. As a result, samples were required to be tested with deflectors located four inches down from the ceiling.

FIRE CONTROL TESTING:

With development of a response test method, changes in the standard fire tests were made and promulgated. These changes involved the conduct of distribution. One-cubic-foot wood cribs were placed at these locations and the amount of weight loss determined after ten minutes of burning. These tests resulted in an observed crib weight loss of approximately forty percent, which was established as the crib weight loss criteria for EC sidewall.

Subsequently, criteria were established requiring that the test EC sidewall sprinklers be subjected to water distribution tests within the confines of the enclosure coverage desired by the manufacturer. Since it had been observed that the water distribution was affected by the piping arrangements, these distribution tests and subsequent fire tests were conducted using different piping arrangements. An elbow feeding downward produced a different distribution than that of a sideway elbow or straight run. The average weight losses of cribs subjected to these exposures were compared against the maximum allowable forty percent weight loss.

EFFECTS OF ENCLOSURE OPENINGS, SOFFITS AND DRAFTS:

Based upon the established test criteria, Listings of these heads were limited to one EC sidewall sprinkler per room in enclosed areas. It was recognized that multiple sprinklers in larger areas would operate more slowly for the same size fire, but so would the control sprinklers. Questions were raised as to exactly how much slower EC sidewall sprinklers and standard sprinklers would operate in rooms having alcoves with perimeter openings, under both draft and no draft conditions, and in multiples at various ceiling heights.

Two basic test series comprised this work. The first series involved a study of the effects of varied perimeter openings, soffits and drafts on the performance of sprinklers. The second series was concerned with the influence of multiple heads and varying ceiling heights.

Figure 2 shows a plan view of the test enclosure. Door openings were varied from three feet wide by seven feet high to a six feet wide by seven foot high door and were located opposingly and diagonally across the room . The fire source was placed near a corner of the enclosure between one of the openings and a corner. Preliminary tests involving an opening directly behind the fire source yielded inconsistent results due to the thermal distribution between the interior and exterior of the room.

The control sprinklers were placed at the center of a fifteen foot spacing, precisely on arc measured from the fire corner. EC sidewall sprinklers were located on the wall parallel to the soffit dividing the room from a six foot square alcove. The ceiling height was eight feet for this series.

Tests were conducted:

1. With and without an alcove, and
2. With and without a fan pushing (forced) and pulling (induced) air from the openings at various velocities.

Air velocities were measured at the fan and checked at various locations throughout the room. Sprinkler locations varied from two inches to ten inches down from the ceiling (i.e., ceiling deck). Three EC sidewall sprinkler models were used for comparative purposes. Other experimental sidewall sprinklers were also examined.

Eighteen tests were needed in this series to enable the variable to be isolated and to facilitate a comparison between standard sprinklers and sidewall sprinklers. Mean (arithmetic average) operating times were used in these comparisons. These mean times were selected from a data range that contained the maximum and minimum averages. This selection was most indicative of the operational performance range of the heads studied. These data are indicated in the figures presented herein as "Mean Maximum Response Times" and "Mean Minimum Response Times."

STATISTICAL CONSIDERATIONS:

Figure 3 depicts differences in standard sprinkler operation times when doors are opened under (essentially) zero draft conditions. Response times are faster with the doors closed. Figure 4 presents EC sidewall sprinkler performance under these same conditions. While no significant differences are noted, the range of operating times is greater with the doors open.

The influence of soffits is shown in the standard sprinkler operating times in Figure 5. Enclosures with soffits have the effect of negating or dampening the influence of opening or closing doors. Having doors open seems to consistently result in slower operating times. A close examination of Figure 6 reveals that the presence or absence of soffits has no appreciable effects on the response time of EC sidewall sprinklers.

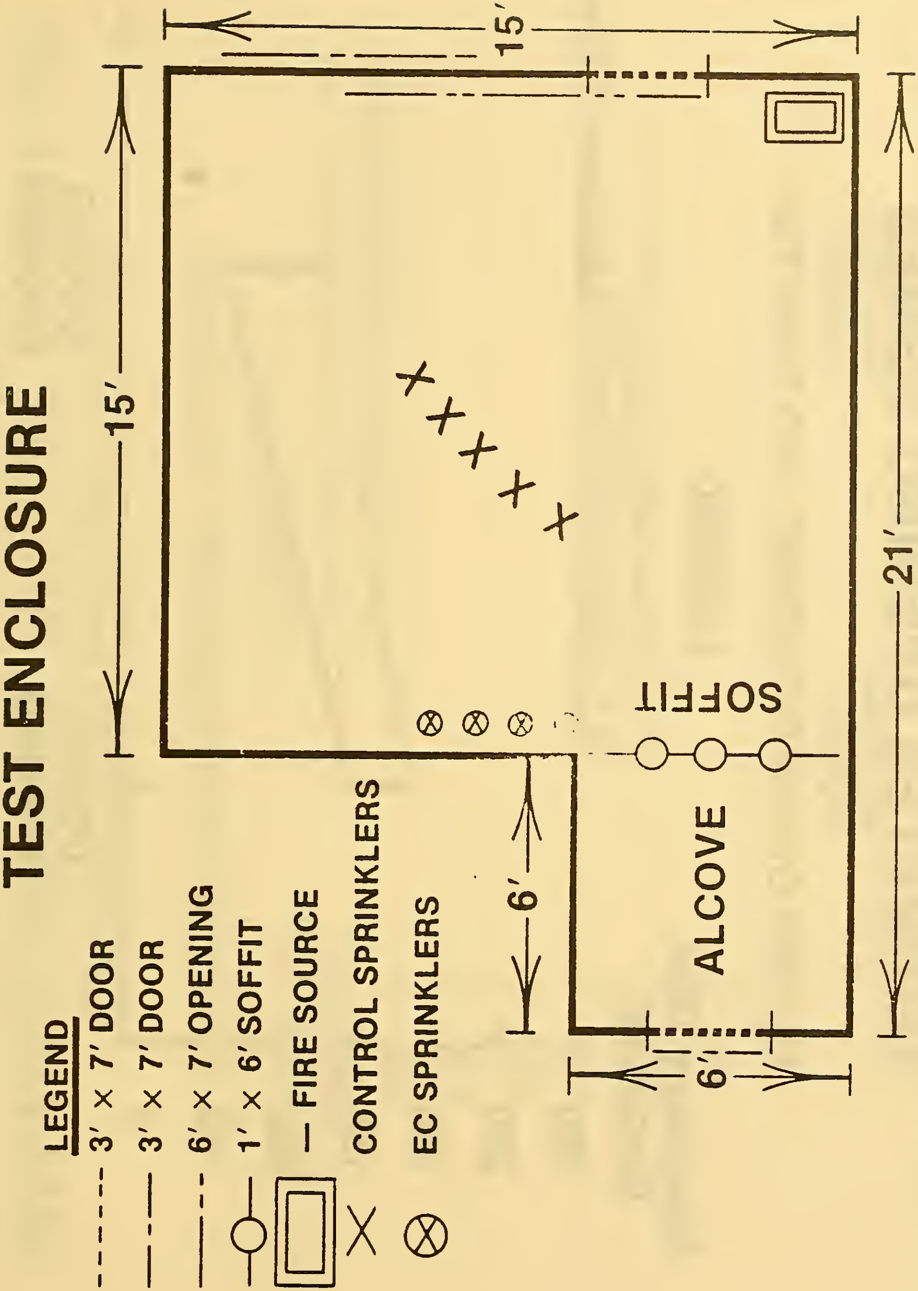

TEST ENCLOSURE
15'
15'
21'
6'
6'
SOFFIT
ALCOVE
LEGEND
3' × 7' DOOR
3' × 7' DOOR
6' × 7' OPENING
1' × 6' SOFFIT
— FIRE SOURCE
CONTROL SPRINKLERS
EC SPRINKLERS

FIG. 2

OPERATION TIMES CONTROL SPRINKLERS PERIMETER OPENING SERIES

DOORS OPENED/CLOSED - NO DRAFTS

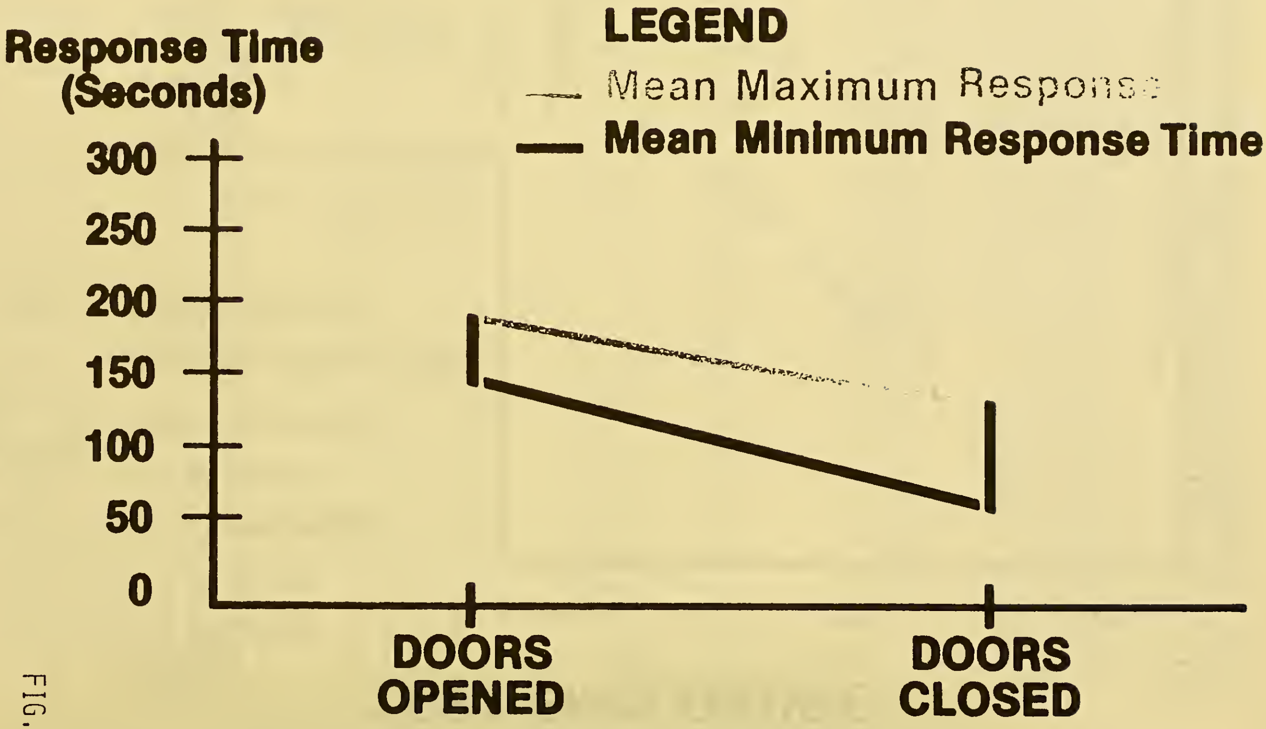


FIG. 3

OPERATION TIMES E.C. SIDEWALL SPRINKLERS PERIMETER OPENING SERIES

DOORS OPENED/CLOSED - NO DRAFTS

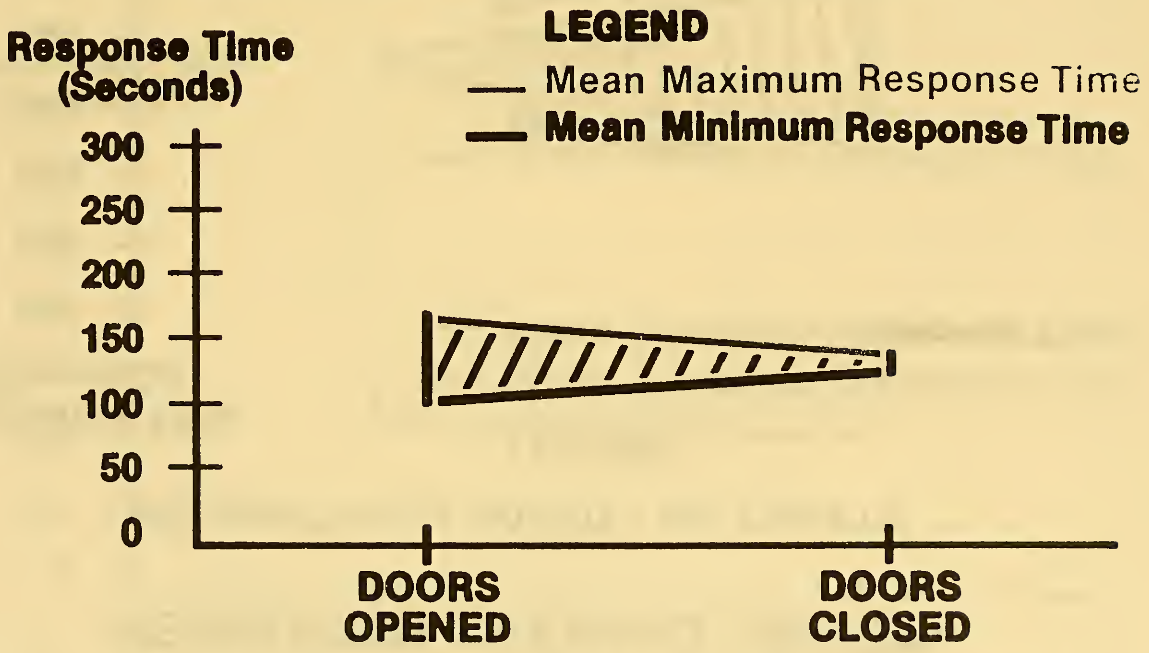


FIG. 4

OPERATION TIMES CONTROL SPRINKLERS PERIMETER OPENING SERIES

WITH/WITHOUT SOFFIT · NO DRAFTS

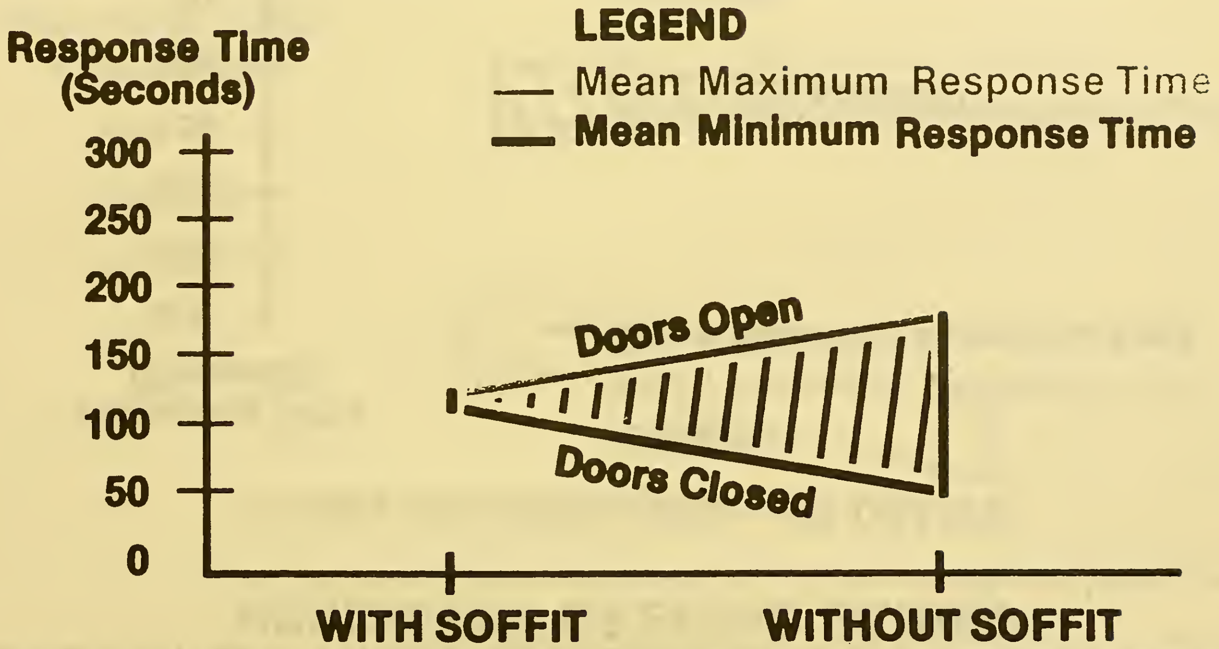


FIG. 5

OPERATION TIMES E.C. SIDEWALLS SPRINKLERS PERIMETER OPENING SERIES

WITH/WITHOUT SOFFIT - NO DRAFTS

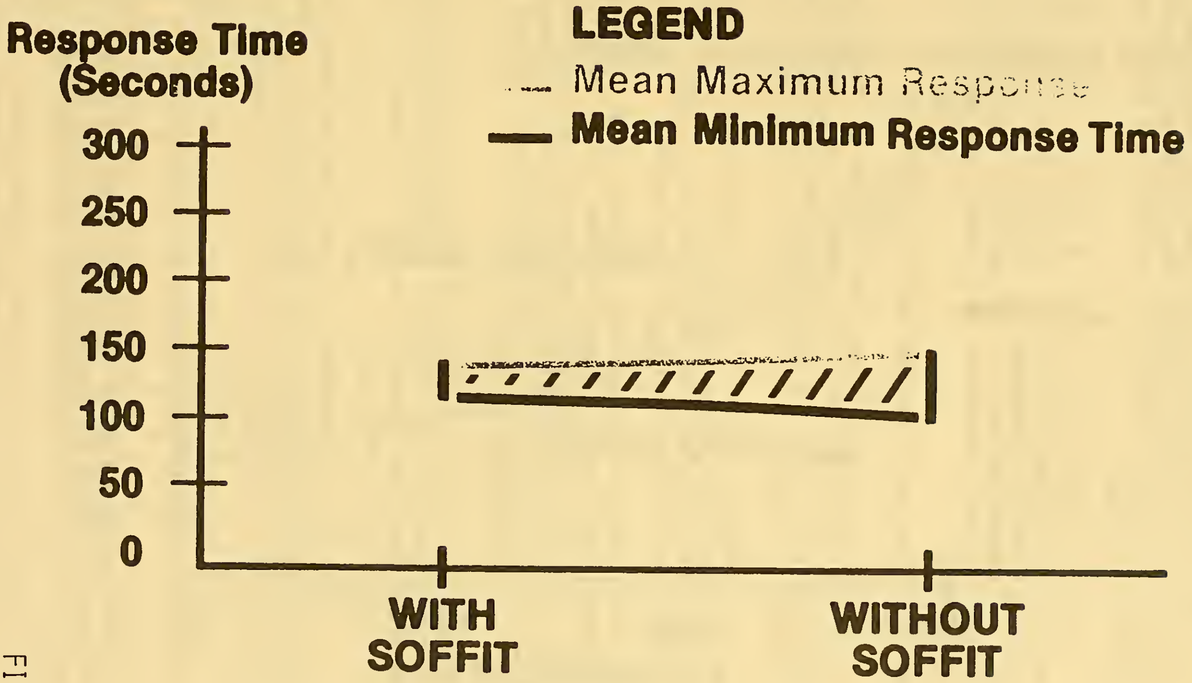


FIG. 6

Figure 7 demonstrates the effects drafts have on standard sprinklers, with air flow toward the alcove. As the air velocity increases, the significance of ceiling-to-sprinkler distances is markedly diminished. In Figure 8, it can be seen that when the direction of draft movement is away from the alcove and towards an enclosure opening, the variability of head response widens as air velocity increases.

The data trends given in Figure 9 establish that, while the influence of drafts is to increase the variability of sidewall response and produce slower response times with increased air velocity, the response is not slower than that of standard sprinklers. The results of these tests, as presented in this figure, represent the maximum and minimum times with regard to the air flow direction.

EFFECTS OF MULTIPLE SPRINKLERS AND CEILING HEIGHTS:

In this twenty test series, the response of installations involving multiple EC sprinklers under fire conditions was investigated. The primary objective of this work was to determine the comparative effects, against standard sprinklers on a fifteen-by-fifteen-foot spacing, of:

1. Remotely located fires on the performance of sprinklers installed on opposing walls of an enclosure,
2. The multiple sprinklers located along these same walls, and
3. Variations in ceiling-to-floor heights.

Fire exposure tests were also conducted using a high ceiling. Sidewall sprinklers were spaced sixteen feet apart, along one wall of a large test room. The test fire was located at varying distances from this wall. In order to develop additional information, sidewall sprinklers were located on special array boards next to the wall and spaced the same distance from the fire as wall-mounted test sprinklers.

Standard sprinklers were again spaced on a fifteen-by-fifteen foot square pattern around the fire. When the location of the fire was varied at distances away from the walls, the control (standard) sprinklers were repositioned accordingly.

In the eight-foot ceiling-to-floor height enclosure tests, the fire size was set to bring about an average control sprinkler response time of approximately three minutes. Varying distances (fifteen, twenty and twenty-four feet) from the fire to the test sprinklers were examined.

Some interesting comparisons can be made of the performance trends indicated in these tests.

In Figure 10 the variation of the standard sprinklers from test-to-test at a given ceiling height is noted. These sprinklers were located on the standard fifteen-by-fifteen foot spacing around the fire in each of the tests, with five sprinklers located at each corner during each test run.

Figure 11 depicts variations in response times for sidewall sprinklers in terms of increasing distance from the fire. Average values are used in this illustrative plot to represent trends. It is important to note that, while the response range of the sidewall sprinklers tested broadens when they are

OPERATION TIMES CONTROL SPRINKLERS PERIMETER OPENING SERIES

AIR MOVEMENT VARIED · TOWARDS ALCOVE

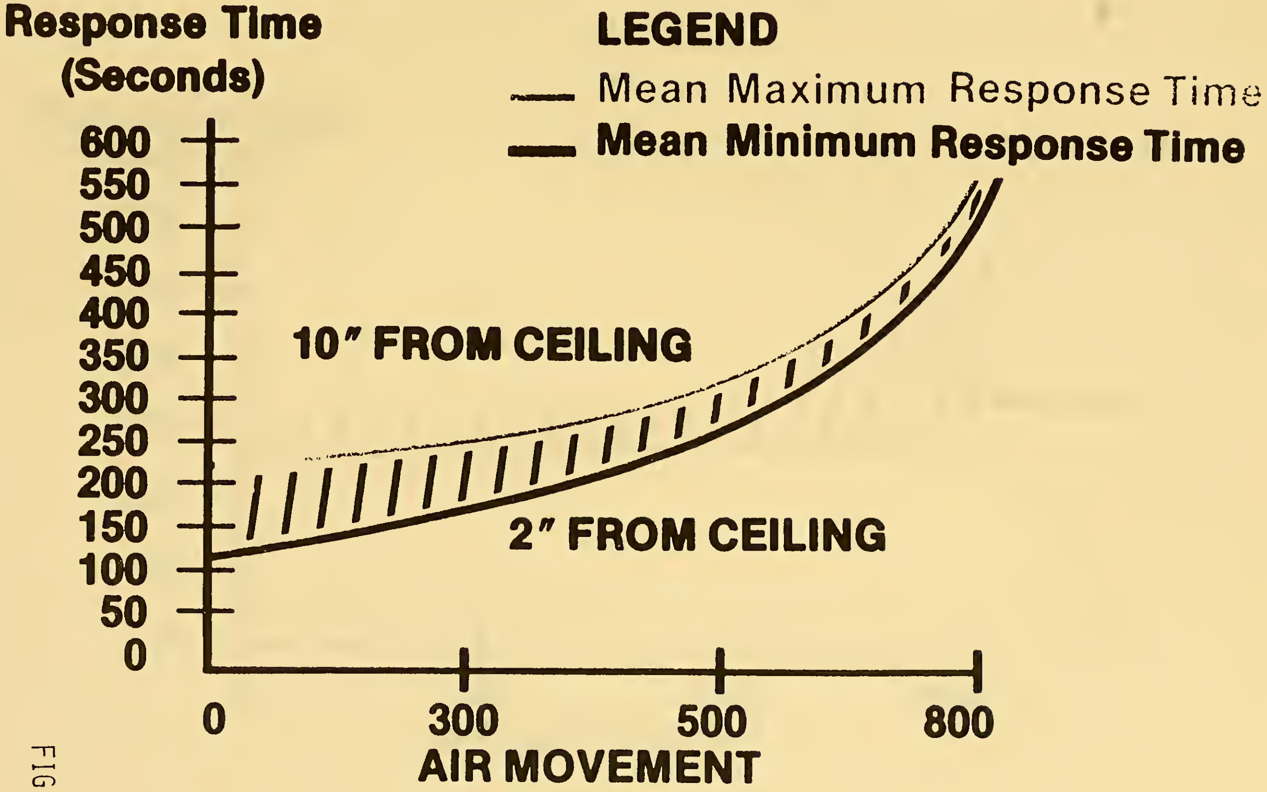


FIG. 7

OPERATION TIMES E.C. SIDEWALL SPRINKLERS
PERIMETER OPENING SERIES

AIR MOVEMENT VARIED

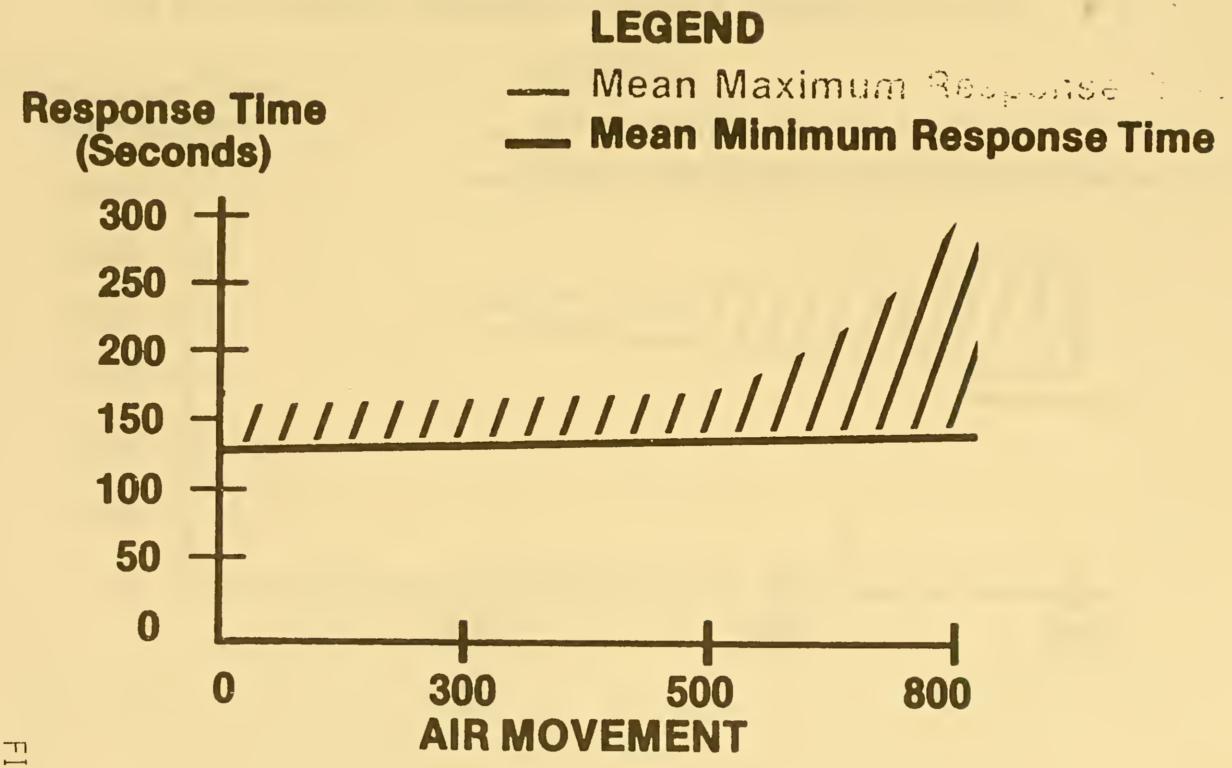


FIG. 8

OPERATION TIMES CONTROL SPRINKLERS PERIMETER OPENING SERIES

AIR MOVEMENT VARIED—AWAY FROM ALCOVE

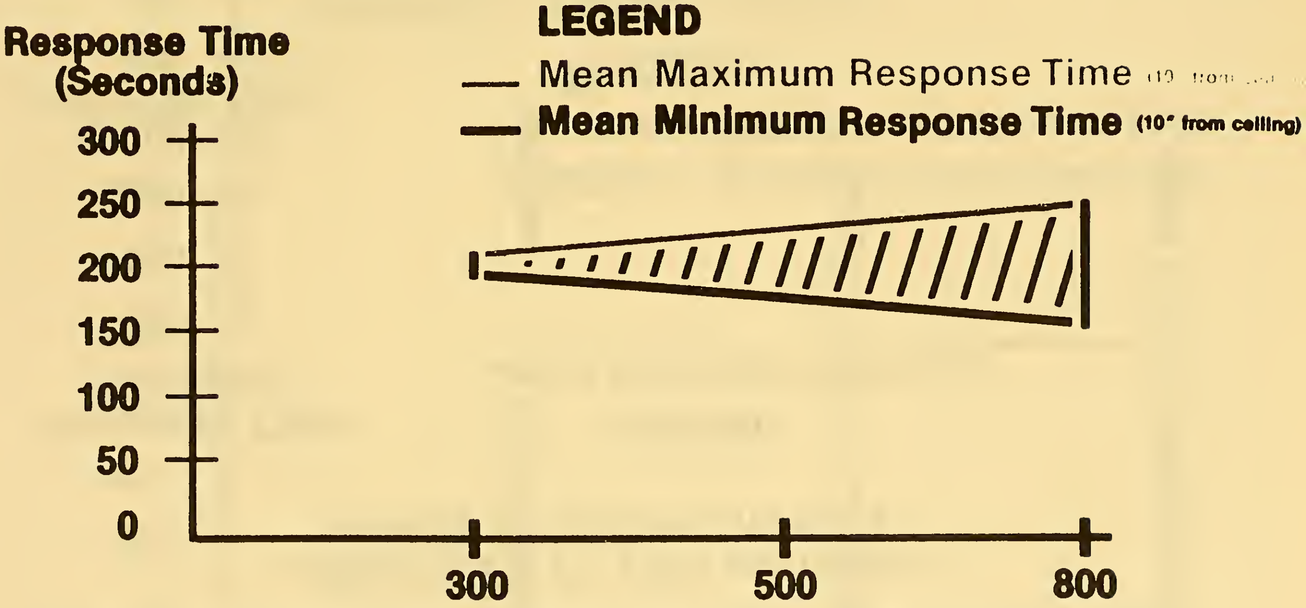


FIG. 9

OPERATING TIMES MULTIPLE E.C. SIDEWALL TESTS/CONTROL SPRINKLERS

SPRINKLER TO FIRE DISTANCE VARIED (8′ CEILING HEIGHT)

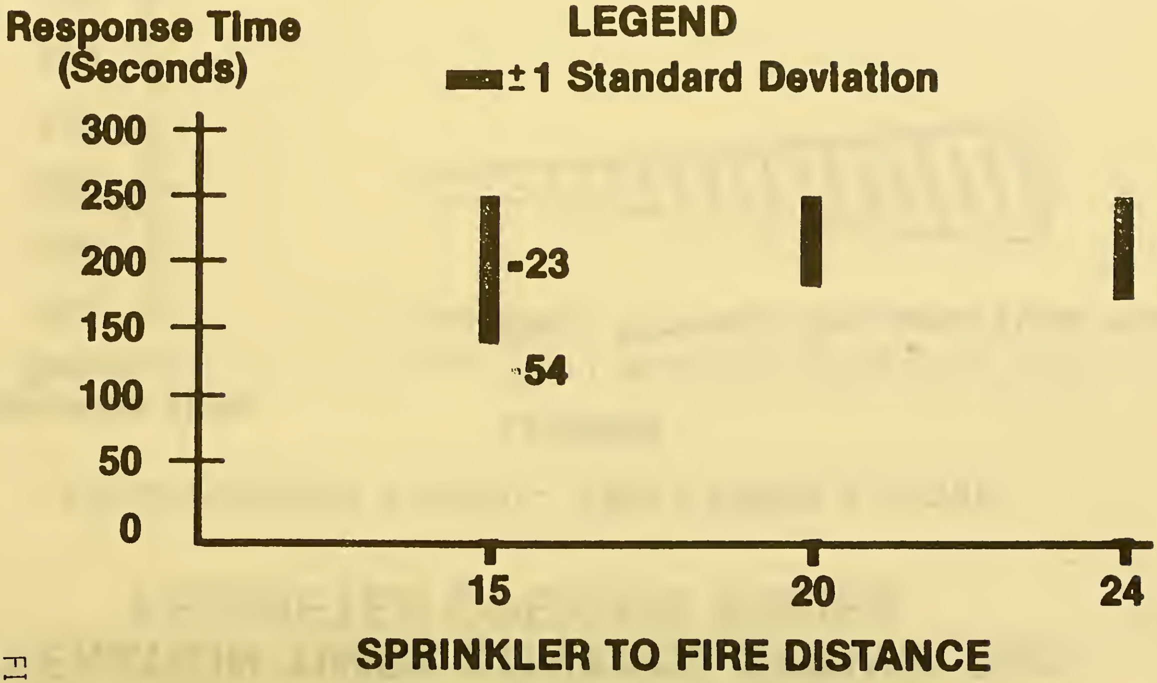


FIG. 10

OPERATING TIMES MULTIPLE E.C. SIDEWALL TESTS/ E.C. SIDEWALL SPRINKLERS

SPRINKLER TO FIRE DISTANCE VARIED (8′ CEILING HEIGHT)

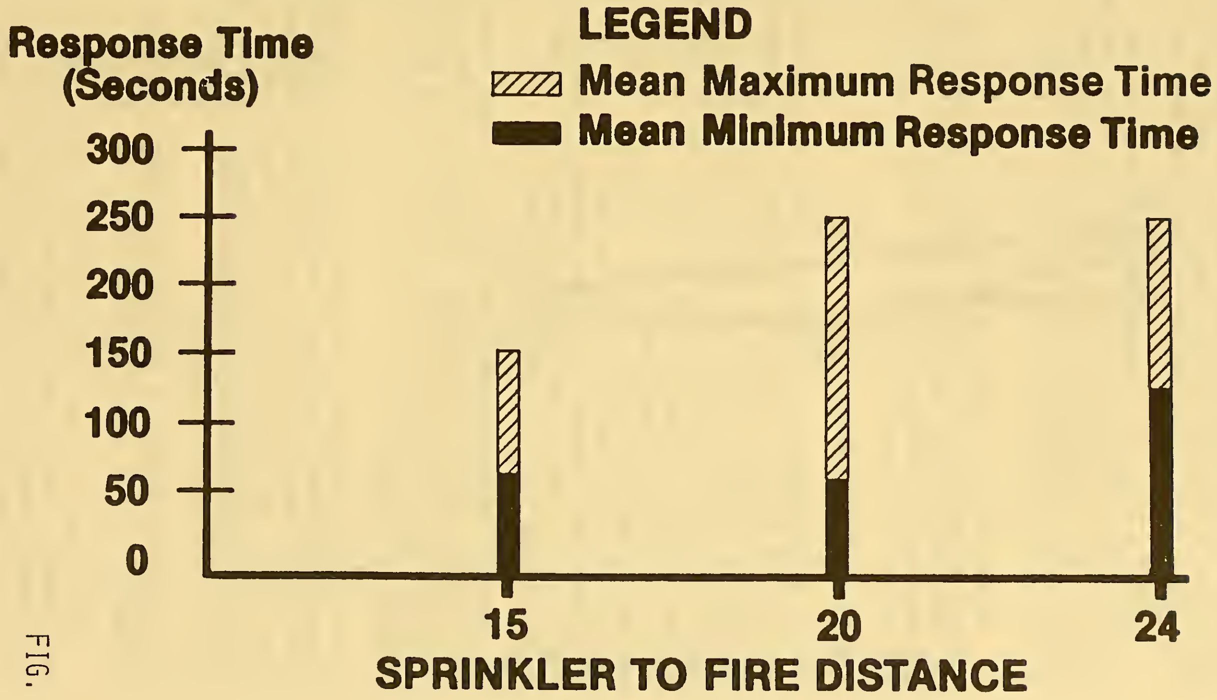


FIG. 11

located at greater distances from the fire, at eight foot ceiling heights EC sidewalls respond within the same average time span as the standard control sprinklers. Subsequent tests to establish repeatability data indicate that this observation can be extended to ceiling heights up to nine feet.

Figure 12 shows the trend of the response of standard sprinklers as ceiling heights are varied. For a given fire size, the operating time shift toward slower responses is relatively insignificant, with the average response varying from three minutes-eighteen seconds, at an eight-foot ceiling height, to four minutes-thirty-seven seconds, at sixteen feet.

An examination of Figure 13 demonstrates the trend of the response of EC sidewall sprinklers with increasing ceiling heights. Average response times for those heads spaced twenty-four feet from the fire ranged from three minutes-nineteen seconds, at eight-foot heights, to five minutes-eleven seconds, at a sixteen-foot height.

DISCUSSION OF FINDINGS:

The establishment of meaningful, technically justified, requirements based on the large body of information produced in these experiments involved a comprehensive rationalization of physical facts and a careful statistical analysis of the data. Using the original test premise and experimental objective, requirements were based on comparing extremes of the data, as well as the averages. A comparison of tolerance limits offered a sound statistical approach. The performance data from a group of sidewall sprinklers were matched against the standard control sprinklers, wherein the premise that the tested heads are to perform "no worse than" the standard heads prevailed. The EC sidewall requirements established through the work discussed herein may be found in the Sixth Edition of UL's "Standard for Automatic Sprinklers for Fire Protection Service," UL 199, dated October 31, 1978.

Important questions about the possible adverse sprinkler operation have been treated during these studies. Drafts (occurring over normally expected extremes of velocity), soffits and openings do not appear to affect the response times of sidewall sprinklers to an extent greater than the effects to standard sprinklers.

A review of the data from the multiple-head test series indicates that EC sidewall sprinklers installed in multiples can effectively suppress fires, particularly when beams, columns and other building elements, serving as thermal dams, lie between back-to-back sidewall sprinkler installations. The comparative effects noted between the response of standard and sidewall sprinklers due to varying ceiling heights indicated correlative performance up to ceiling heights of nine feet.

DEVELOPING AND DRAFTING A PRODUCT ACCEPTANCE STANDARD FOR RESIDENTIAL SPRINKLERS - EARLY ORGANIZATIONAL INPUTS:

The relevance of early (Circa 1972-5) inputs contributed markedly to the development of the residential sprinkler concept over the last five years. Even summary coverage is impossible. Let it suffice to say that all factions of the fire community have contributed to varying degrees. The following briefly identifies major organizational sources of performance, installation and end-use data:

OPERATING TIMES MULTIPLE E.C. SIDEWALL TESTS

CONTROL SPRINKLERS
CEILING HEIGHT VARIED/
E.C. SPRINKLER-TO-FIRE DISTANCE VARIED

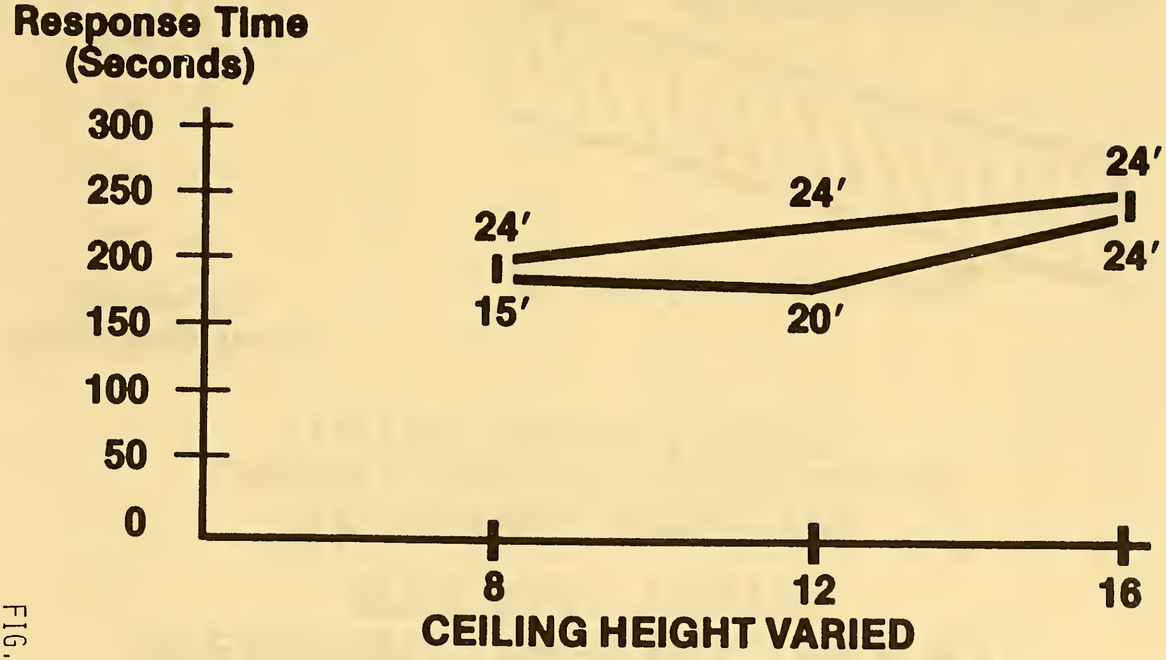


FIG. 12

OPERATING TIMES MULTIPLE E.C. SIDEWALL TESTS

E.C. SIDEWALL SPRINKLERS CEILING HEIGHT VARIED/SPRINKLER TO FIRE DISTANCE VARIED

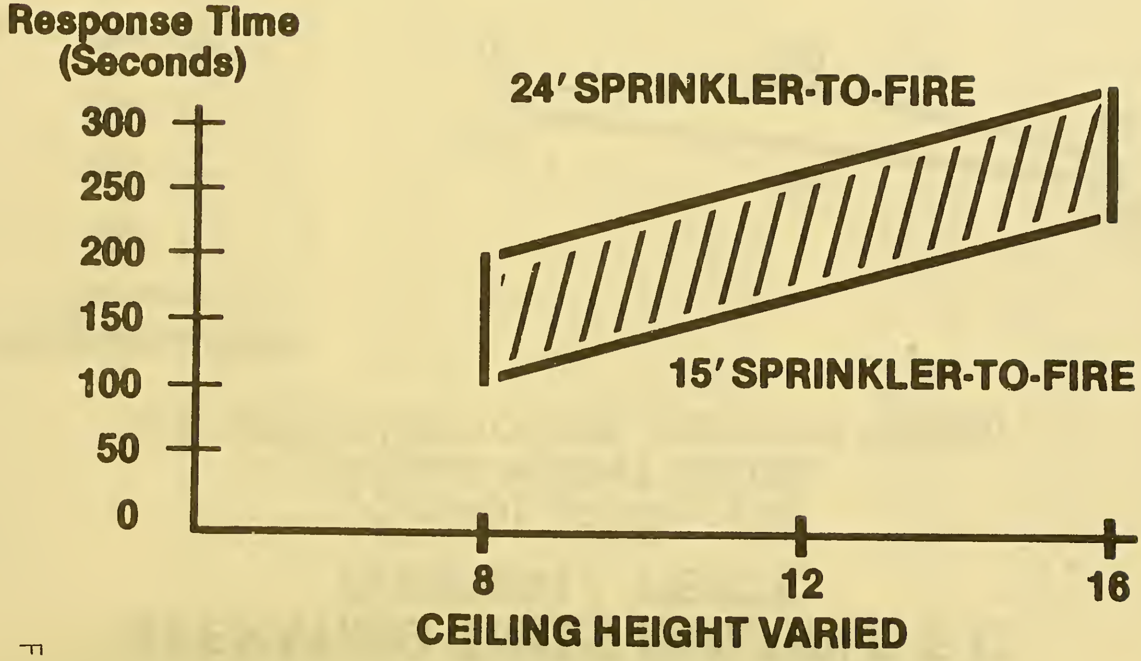


FIG. 13

NFPA - Technical Committee and Staff efforts to generate the NFPA 13D Standard covering residential installation considerations.

UL - In-house research testing, formation of multi-interest ad hoc committee to develop methodology, conduct of industry sponsored tests on EC sidewall sprinklers.

FM - In-house research testing and development of full-scale test methodology.

USFA - Conduct of conferences, meetings and other discussion forums.

SPONSORED AND IN-HOUSE FULL-SCALE FIRE PERFORMANCE TESTING:

Based upon these early inputs, a series of full-scale fire performance tests are being sponsored by USFA at FM's facilities in Massachusetts and the Los Angeles Fire Department facilities in southern California. In addition, in-house industry research efforts continue to be carried out toward the development of the hardware needed to make the residential sprinkler head a cost-effective and fire suppression-effective product. Although all factions involved must fully commit to the concept if it is to become a reality, the commitment of the industry is particulary vital. Without the necessary manufacturing technology, the product could remain a concept.

DEVELOPMENT OF TESTING METHODOLOGY:

Using inputs from the NFPA 13 Committee, UL and FM in-house research efforts, USFA Conference dialogs and the results of USFA sponsored full-scale fire performance testing of candidate residential sprinkler heads, the process of producing a product acceptance standard shifted into a test methodology development phase in 1976-77.

This phase was an essential step pursuant to the initiation of the drafting of a standard. Again, UL, FM, NFPA and industry contributions were accumulated. Specifically, this preliminary work involved consideration of the applicability of test methods used by UL in the Listing and factory follow-up testing of standard sprinklers in accordance with the UL Standard 199 for Automatic Sprinklers and in FM's sprinkler approval system, under the umbrella of NFPA 13D installation requirements.

INITIAL WRITING EFFORTS:

At this point in the development process (Circa 1977), both UL and FM generated proposed drafts of standards applicable to the product acceptance testing of sprinklers having quick-response and extended-coverage features for residential and other special end-use applications. These preliminary draft standards serve as a portion of the technical documentation being reviewed as a first step in the recently initiated USFA sponsored project for the development of a residential sprinkler product acceptance standard.

COORDINATION OF EFFORTS:

By way of coordination of related efforts by UL and FM, USFA initiated a standards development project for residential sprinklers in July of 1979. The project plan involves the following seven steps:

1. Review of previously developed data and test methodology,
2. Development of performance requirements,
3. Fire performance verification testing of the proposed requirements,
4. Preparation of a draft standard,
5. Review of draft standard by USFA, industry, and others,
6. Revision of draft standard, and
7. Release of proposed standard to USFA for further processing as a national standard.

The project has progressed well into steps one and two as result of two successful working sessions, one in August and the other in September, involving UL and FM, with USFA and industry participation. Verification testing and drafting of the standard are to follow.

A preliminary outline of the standard includes mechanical, operational, material and fire suppression requirements aimed at measuring residential sprinkler performance and reliability. These requirements are as follows:

1. Mechanical -
    a. Leakage
    b. Heat responsive element strength
    c. Assembly load/frame strength
    d. Hydrostatic strength
    e. Calibration - "K" factor
    f. Water hammer
    g. Vibration
    h. Rough usage

2. Operational -
    a. Temperature
    b. Lodgement
    c. Cold soldering

3. Material -
    a. Corrosion
    b. Stress-corrosion cracking
    c. Moist-air
    d. Strength

4. Fire suppression -
    a. Sensitivity
    b. Water distribution
    c. Fire

POTENTIAL ACCEPTANCE AND USE OF A RESIDENTIAL SPRINKLER PRODUCT ACCEPTANCE STANDARD:

Perhaps the most critical element of the overall process of developing a residential sprinkler product acceptance standard is the degree to which acceptance and use of the standard can be brought about.

The following considerations will bear heavily on this element of the process:

1. Manufacturing technology -
    a. Industry
    b. Private research organizations

2. Installation standards -
    a. NFPA 13D
    b. NFPA Fire Codes

3. National standardization -
    a. ANSI
    b. UL

4. Listing, approvals and regulations -
    a. UL
    b. Federal, state and municipal authorities
    c. Code groups

5. Consumer education -
    a. NFPA
    b. USFA

SUMMATION:

Based on the inputs compiled to date, through NFPA committee discussions, USFA sponsored research, industry forums and UL/FM standards writing meetings, it can be stated that the concept of the residential sprinkler can become a reality if the multi-faceted program now in motion is followed with full commitment by all parties concerned. In summary, this program now includes the following:

1. Develop a technically substantiated, multi-parameter product acceptance standard, based upon state-of-the-art performance requirements stemming from comprehensive full-scale fire testing, in concert with necessary manufacturing and installation technology,

2. Bring about national standardization for purposes of uniformity,

3. Promulgate Listings, approvals and regulations for authority and user acceptance, and

4. Promote consumer education to establish a full awareness of the potential for reducing the risks of fire in residential dwellings.

Work will continue toward the generation of the test methodology, standards, Listings, approvals, regulations and educational programs needed to make the residential sprinkler concept a reality. In the final analysis, it is only through the conduct of comprehensive fire performance experimentation that questions about the effectiveness of residential sprinklers can be answered - Concept or Reality? -- the answers are in the testing.

DR. LYONS: (Moderator) May we have the panelists up on the podium, please. The next subject on the agenda is a panel discussion on the proposed new NFPA 13D Standard. Rolf has been threatening you with four hours of material on this subject and I have only been able to protect you from it for the last hour.

Unfortunately, since Chet Schirmer is not with us, Rolf has been appointed panel chairman, and, therefore, I guess he has free license to do whatever he wants with that material. And he can also run you right through into the cocktail hour if he sees fit, because he's going to take over these proceedings.

Rolf Jensen.

PANEL DISCUSSION ON THE PROPOSED NEW NFPA 13D STANDARD

Rolf J. Jensen

President

Rolf Jensen & Associates, Inc.

Panel Chairman

PANELISTS:

Richard E. Hughey, Assistant Manager - Engineering Department
Insurance Services Office

Bruce W. Hisley, Division Chief
Anne Arundel County Fire Department

Graham Clarke, Manager of Engineering, Western Operations
Grinnell Fire Protection Systems Co., Inc.

Ronny J. Coleman, Director of Fire Protection
City of San Clemente, California

MR. JENSEN: Thank you, Mr. Lyons. Actually, have no fear. John Lyons said he was leaving before we get done, so we don't have to stay on time any more. Where is Dosedlo? Did you scare him out, Tom? If he doesn't show up pretty quick, you're going to have to sit up here.

Our panelists consist of, Dick Hughey, Assistant Manager of the Engineering Department, Insurance Services Office. Dick is a member of 13D, a member of NFPA 13. He is a twenty-five year experienced fire protection engineer. He's an ITT graduate of about 1953, if I remember correctly.

And his claim to fame is he's still trying to figure out why they cut the holes in rubber tires at UL before they burned them in 1953 in the rubber tire tests.

Ronny Coleman is Director of Fire Protection, City of San Clemente, California. Ronny says his biggest claim to fame is that his secretary wrote this resume. He said he's held that position since 1973. He has an AA degree in Fire Science from Santa Ana College and a Bachelor of Science Degree in Political Science. So you guys look out for him, he's probably going to be running for office before we get done with this panel.

Graham Clarke has a BS degree from Loyola College in Montreal and from McGill University in Montreal. He was eight years with Factory Mutual Research in standards writing. He has been on the NFPA 13 and 14 Committees and has been a member of the NFPA 13D Committee for at least three weeks that I can recall, something like that, anyway. He's currently Manager of Engineering of the Western Operations of the Grinnell Corporation.

Bruce Hisley is the Division Chief with the Anne Arundel County Fire Department. He's been with the Fire Prevention Bureau in Anne Arundel County since 1966. He's come up pretty much through the ranks as a fire fighter and fire officer. From what I can see of your resume here, Bruce, a member of a number of NFPA committees, including NFPA 101 and active in a great number of NFPA operations.

Lee Dosedlo is a graduate of ITT, 1963, in Civil Engineering. He couldn't get into the FPE department, I guess, even though he went to the right school. He's been with Underwriters Laboratories for sixteen years and is currently an Engineering Group Leader there. He has been on the Sprinkler Committee and on the 13D Committee for, I think, just about since the beginning, and has been extensively involved in testing of sprinkler systems and sprinkler system equipment at UL and a number of other standards-making committees.

Now, what you have here is five people and myself, four of us are on 13D, so we got those other two guys overwhelmed. And they ain't going to get equal time. What we are going to do is try and give you some of the views of different interests on the committee and of some of the views of people in the fire service in regard to 13D.

Our focus for this is going to be the proposed NFPA 13D Standard. We would like to give you some comments on its content and what we were hoping to get out of this is some feedback on its content and how it can best be implemented.

Now, with that I'm going to start from the middle and we are going to let Graham Clarke lead off.

MR. CLARKE: Thank you, Rolf. In case I don't get a better opportunity, I'd like to start by thanking the USFA and NFPA for asking me to be involved here this afternoon. I consider it a privilege and I really do feel a sense of purpose in being involved in the Residential Sprinkler Program, as I'm sure we all do.

I am sold finally and eventually on the concept of reducing life loss and injuries and property damage through the use of residential sprinkler systems. I try to be a pragmatist and I recognize the current NFPA 13D, that is, the 1975 version, has not been widely used due to the cost of the system given birth to by that standard and, of course, other factors.

Some things have happened since 1975, and I'll provide a short list of those things as I see them, not necessarily in any particular order. One is the involvement of the federal government, and that's turning out to be a very significant factor.

Increased awareness in the fire protection community of the concept of residential sprinklers may have appeared to some of us at first blush to be something that was totally unheard of and, yes, it was, but we are becoming more and more aware of it as a concept.

Some media play on this subject, an article in "Business Week," for example, and several other publications.

Interest by the insurance industry in exploring the possibilities of reducing home insurance premiums, at least the fire portion of them, for those homes where residential sprinkler systems are installed.

The fact that the current 13D, when tested at Factory Mutual, as Mr. Rhodes pointed out this morning, under those specific conditions was less than adequate. So the point there is that that pointed up the need for an improvement and a coherent effort spearheaded by the federal government bringing together several groups, several diverse groups within the fire protection community, to promote both the concept of residential system installations and to promote the concept itself.

The development of a super sensitive sprinkler, something that's on the order of magnitude of six times as sensitive as anything commercially available right now, and much testing.

Okay, so that's kind of a laundry list of the kind of important things as I see it and the things that have happened since 1975.

I think it's important to recognize at this point, and I guess in a way we are kind of biting the bullet by making a statement, that the draft of 13D that now exists has not significantly reduced the cost of residential sprinkler systems over that contemplated by the 1975 version of 13D.

For one thing, for two things, we have reduced the sprinkler spacing and we have also increased the flow required by the system.

Final point is that, having done those things, we are in a better position than we were with the 1975 standard mainly because we had something that we have a growing confidence in as an effective and usable tool.

So with that I'll turn it back to Rolf.

MR. JENSEN: Not for long. We will let Bruce Hisley pick it up in regard to his views and experiences of what the fire department problems are in trying to get residential sprinkler system action in their community. Bruce.

MR. HISLEY: Thank you, Rolf. Speaking as a member of the fire service and a code enforcing official, I'm very interested in the development of the 13D system as it stands today. I believe the 13D system that's to be adopted as a required regulation in a local jurisdiction will have to be demonstrated as cost effective to both the public and private sector.

In attempting to have the present 13D system adopted in our county as part of our adequate facilities ordinance, fire suppression criteria came under heavy fire. The cost effectiveness question was one of the major political concerns that had to be addressed by the fire department.

And if a jurisdiction is to be successful in adopting a regulation for residential sprinkler requirements, whether it's a 13D system or something of that nature, it must be prepared to direct and deliver a major educational campaign that addresses all sectors of the community.

At the present time, our County is increasing in population by eight percent a year. We now have a population of 350,000. At present, about thirty percent of the land is developed. At the present, there are about 2,500 residential units being constructed in the County annually.

A lot of pressure was brought to bear on our existing facilities in the County due to the growth rate. A desire by the County Executive and Council to keep the tax rate from soaring out of sight, but still maintain adequate facilities for Public Protection, Roads, Sewer, Water, & Education was needed.

The County developed an adequate facility ordinance that was adopted as part of the Planning and Zoning process in the County Government. Fire suppression was one area that was addressed. In the fire suppression criteria, we set up certain criteria and standards that would determine adequate fire suppression in new areas of the County to be developed.

One requirement was water supply sources. If there was Public Water a certain deliver rate of water would have to be provided. Depending on the type of development where there was no Public Water supply system available in the area, the provision for 5,000 gal. water holding tanks was required.

The ordinance also required a five minute response time as the optimum time that we wanted our first arriving Fire Engine to be able to respond to an alarm or fire after receiving the call.

Roughly thirty percent of the County land area was outside the five minute response time criteria. If a developer wanted to build in the area beyond the five minute response time, he would be required to install a 13D sprinkler system in all homes built in that subdivision or wait for a fire station to be built at some later date.

Needless to say that caused quite an uproar because there was quite a lot of publicity and everybody knew about it. It was a very major upheaval. It was a definite new concept and we came under heavy attack for this particular radical type thinking that we were suggesting.

We prorated a thousand-home development; if A13D system cost an average of $1,250 per home, there would be $1,250,000 spent to provide sprinkler protection for that thousand-home subdivision. If we built a fire station to provide protection for that thousand-home subdivision over a twenty year period, that station would cost the taxpayers about $6,400,000; that's in salaries, cost, maintenance fees and a new engine after 15 years.

There was a difference of about $5,400,000. That would have been a savings over a 20 year period to the taxpayer. Even with this savings demonstrated, it still was not enough.

Citizen groups, as well as developers and real estate agents, were highly emotional on this idea. The builders basically took a neutral stand. They said if it's required, it will not mean one builder will have an advantage over another because they would all have to put the system in.

But our real estate people were the main concern. There were strings attached to property beyond five minute response time. They thought that would mean problems selling property to builders. They were the main obstacle and they were successful in having some part of the program defeated.

So we weren't successful in having the program adopted, but we were successful in getting a sprinkler system put into a sample home for cost analysis.

The system was analyzed and, as a result of that, the builder now in the subdivision is now selling the system as an optional provision for a potential 90 homes. He sold one system out of 90. It's inconclusive to tell what that means.

I should mention that the subdivision is within sight of a local County Fire Station and people have a sense of having good Fire Protection by seeing a fire station up the street from where they live.

The system installed in the sample home ran about $990. That was the plumber's price to the contractor. The contractor sold the system as an option for about $1,380. What we are competing with in a home is do you want air conditioning, do you want a washer and dryer, or do you want a sprinkler system.

Well, most people are taking the air conditioning and the washer and dryer. It's a hard thing to compete against. They use that every day and they can't perceive the fire danger. As it stands today the cost of the system has increased twenty percent from what is was in June of 1978.

We are now looking at a system that cost $1,156, that is protecting a 1,400 sq/ ft. living area with 14 sprinkler heads. No sprinklers are in the attic, bathrooms, or small closets.

If we are going to be successful in having systems installed in homes, we will have to make it more attractive to the public. I'm not very encouraged with what is being proposed in the new 13D system, but if improved engineering is needed we will have to live with that, but maybe if there are other avenues of saving that can be shown, such as depreciated tax, tax credits, such as the solar energy tax credit, that could be applied to fire suppression systems or possible reduction in Fire Insurance Rates. If there's a package put together that could equal $125 to $150 dollars each year for several years then the home owner could see a saving in the cost of the system which would be a major selling point.

So that basically is what we are doing in our area on residential sprinklers.

MR. JENSEN: No. 3 on our panel is going to give us some comments on the question of the insurance industry involvement, and particularly insurance credits, which have come up several times already today. Dick Hughey.

MR. HUGHEY: I got to get away from these guys, I might throw things. Rolf read the introduction that I wrote. He didn't tell you all that I wrote. I also have a little history on him. In 1953, when I was stacking those rubber tires, Rolf was lab assistant at that brick factory in Northbrook, Illinois, that then and now is Underwriters Laboratories.

As Jack Rhodes said this morning, for over a hundred years the insurance industry and, from my viewpoint, ISO and predecessor fire insurance rating organizations have been interested in evaluating property protected by automatic sprinkler systems.

For most of those years the installation of and the interest in these systems has been for manufacturing and mercantile profit. Essentially large credits in the fire peril rates are possible for these properties because of the excellent history of protection.

Sprinkler systems are installed throughout nearly 300,000 properties of that type in the United States. I was a little surprised that it was not more. Three hundred thousand properties doesn't sound like very many compared with the millions of residences that we are here talking about today. But nevertheless that's a fairly accurate estimate of the number of installations.

The credits I'm talking about are relatively well known and have been used for engineering economic studies, which often prove that systems can "pay for themselves in a reasonable time." The credit is a variable calculation. It depends on the construction, occupancy, exposure, and other protection that might be available at the rated property.

The credit for adequate sprinkler protection might be very large in a wood frame building used for cabinet making, and it may be very small in a good fire resistant building that, for example, would be a high-rise office building.

What I'm saying is that generally the percent credit is greatest for the poorest construction with the most serious causative hazards, and is least for the best construction with light hazard occupancies.

Now, what has all this got to do with low-cost residential sprinkler systems? My answer is that even I must stand back from the conclusion that sprinklers are the panacea, that insurance savings will pay for them, and that they cause no damage and extinguish all fires. They are not, it will not, and they do not.

I guess you could say, and I think Rolf did say, I'm a charter member of the NFPA Technical Subcommittee responsible for Standard 13D. The interest in Standard 13D goes back to January, 1971, when, following a series of residential fire tests in Newton, New Jersey, an ad hoc planning and evaluation subcommittee was appointed.

In addition, tests were conducted in the summer of 1971 in a high-rise hotel in Tucson, Arizona, with help from the Copper Development Association.

As a result of that ad hoc committee, two standing subcommittees of Standard 13, the Water Supply Subcommittee and the then High-Rise Subcommittee, submitted amendments to NFPA Standard 13 affecting Chapters 2 and 8 of the 1972 edition. That was the first sprinkler standard with density requirements for light occupancies in hydraulic terms.

Because of that beginning, the subcommittee of Standard 13, called the Subcommittee on Sprinkler Systems for Life Safety, Light Hazard, and

Residential Occupancies, first met in September of 1973. We met in Rolf Jensen's office.

I want to read a short paragraph of the minutes of that first meeting.

The subcommittee first addressed itself to defining its scope and establishing a priority for the work assigned to it. We concluded that we had essentially two charges. First, to develop other material for NFPA 13 or for a separate standard dealing with life safety and light hazard occupancies. And, second, to develop material for a standard for residential occupancies, one- and two-family dwellings and low-rise apartments.

The committee decided to direct itself first to the question of one- and two-family dwellings and low-rise apartments.

Through the efforts of that Subcommittee the 1975 standard of 13D, sprinkler systems in one- and two-family dwellings was adopted, first by the 13 Committee and then by the voting membership of NFPA.

Now to my story. Even before the 1975 adoption, as a subcommittee member with a privileged copy of the draft, I was discussing the potential for fire insurance rating credit with the home owners rate committee at the Insurance Services Office. Consequently, when Standard 13D became available for public use, we were ready with advisory credits in home owners' policies.

The credits available today appear very small in relation to those for manufacturing and mercantile property - a suggested five percent of the home owner's premium for sprinklers installed throughout, including bathrooms, closets, attics, and communicating attached structures. However, the home owner's premium is an indivisible single premium representing multiple perils.

As most of you might know, the home owner's policy covers burglary, liability, and water damage from plumbing systems, in addition to the fire peril. As I mentioned before talking about high-rise buildings, water damage may also be adverse on a residence, and if sprinklers are taken from plumbing systems, the damage is already an included peril in the home owner's policy.

Be that as it may, the ISO rating committee did recognize the value of sprinklers with a credit. Now, while this total home owner's premium is indivisible as a peril, as I indicated, it's been estimated that approximately forty percent of the premium can be attributed to the fire peril.

Considering the fire portion only at forty percent and the credit currently available at five percent of the total, it can be demonstrated, and I don't like to twist these things because I'm not a statistician, but it can be demonstrated that the actual rate for fire insurance has been reduced by five-fortieths or twelve and a half percent, which is a very reasonable credit again for a light hazard occupancy in good construction for the occupancy class.

This credit has not yet been extended into the ordinary dwelling or other habitational programs. But with increased use due to the proposed 13D Standard which we all hope for, I have no doubts that new, if somewhat low and conservatively speculative, credits will soon be available in all of these programs.

At least we at ISO Engineering Division will be urging that consideration.

What I seem to hear, listening to the other speakers today, caused me to bring out an anonymous quotation. "The really wise man isn't the man who wants a thing proved before he will believe in it, but rather the man who is prepared to believe anything until it's shown to be false."

I think that's a motto for this seminar.

One other thing that I did write down as I listened this morning was the often repeated quotation that perhaps eighty-five percent of the fires may be controlled in residences by sprinklers. But it is the remaining fifteen percent that we all understand contribute to, let's say, eighty-five percent of the dollar loss.

Therefore, the insurance credit must be somewhat the reverse of those fires that are controlled and perhaps fifteen percent, but not eighty-five percent.

I think tomorrow that Ralph Jackson from Allstate Insurance has a rather interesting proposal for additional testing. This might influence the insurance industry to even more action on these credits for sprinkler systems in residential occupancies.

MR. JENSEN: Dick, you gave me two ideas from your talk. One, we got to get these researchers working on a sprinkler system that flushes those burglars out of the house and then we will really get some insurance credit.

And, second, instead of designing for the eighty-five percent of the fires that constitute fifteen percent of the losses, what we are going to do is turn this thing around so we design only for the fifteen percent of the fires that constitute eighty-five percent of the losses. Okay?

MR. HUGHEY: Great.

MR. JENSEN: Next is Ronny Coleman. Ronny comes from that place out west where they have funny laws like Proposition 13 and all kinds of other neat things. And he's going to tell about how they have been working on some programs to get some 13D systems installed in Richard Nixon's house.

MR. COLEMAN: What's really funny is it is sprinklered, but it's sprinklered to 13 in the walls and the United States government owns it.

First off, before I make my comments, I'd just like to take a straw vote to find out how many people in the audience right now are actually municipal fire service or county fire service type people, in other words, in-service fire fighters. Gives me some idea of the nature of the number of people I might offend before I get done.

I would like to use a quotation to kind of follow up on what Dick said about the fact -- by the way, I teach in the fire command series at our fire academy and I spend most of my time on the other side of the coin preparing fire officers for the eventual problem of dealing with fires in these occupancies.

One of my students brought to me one day a quotation he took from an article about Vietnam. It said the generals are always preparing to fight a war as long as it's fought like the last one was. And that's one of the problems that we are beginning to face in the fire service is the fact that the war is beginning to change.

As was mentioned by Rolf, in California we have infamous Proposition 13 being followed up very shortly by another proposition called Proposition 4, which is again an initiative. It's forcing the fire service, at least in my area of the country, to take a long hard look at just exactly what our role is and what the reality is of delivering fire protection services to the community.

In that context, many fire departments - I want to place myself also in one restrictive area when I start talking, what I'm about to say has to do with a limited number of fire departments that are taking this particular course of action at this time and by no stretch of the imagination am I speaking for the fire service as a whole - many fire departments are now beginning to take an attitude that fire protection and the role of a fire department should be that of a prescriptive role of combating fire problems rather than a reactive role, and that is to say picking up the apparatus and responding to the scene after an alarm has already started to be initiated; this resulting in a shifting of philosophy that's being expressed not only by fire departments, but by city managers, by politicians, by a variety of other people, that fire protection is not necessarily a public responsibility any more.

By that I mean that there's a good possibility, with eroded tax bases and with a different philosophy about what constitutes the support level that a fire department is going to get, that in order to maximize anybody's fire potential, maximize the protection in the community. It has to be a balanced system between the public sector and the private sector.

We have heard a lot of discussion and dialogue about cost benefit and who is going to pay the insurance premiums and so forth. And one of the elementsthat has to be considered in this last formula is what it costs to provide public fire protection. It's no longer an inexpensive commodity in a community. Matter of fact, in terms of total value of dollars spent, police and fire services constitute a significant portion of almost every major community's budget.

Now, what this means to fire departments and to me specifically is that it's been my responsibility in my community to take a more diversified approach to providing fire protection. We are taking what they call the master plan process. That is to say that the fire department is only one element to the delivery of fire protection and that there are many other elements to it, including alarm systems.

In fact, Friday I will be attending the alarm seminar here for the same purpose we are all here today - to pick up new information on remote alarm systems.

The sprinkler system concept that's being advocated here today, and which I am in full agreement with as far as its utilization, is only one element to a system. And, as such, can no longer be considered as an entity that stands unto itself.

For example, one of the things that went through my mind, and has gone through my mind throughout the entire discussion, is that almost all of these tests are pre-determined to go to completion without intervention by fire fighting forces. I mean that's the natural spin-off of the testing process. When, in fact, the installation of sprinkler systems in my community is not only anticipated, but it's predicted there will be intervention by fire fighting forces within a certain relative period of time.

The role of the fire chief, in my opinion, and the reason why I think it's significant there be fire service people here today, is that Proposition 13, boy, what a Freudian slip, pamphlet 13D isn't going to be worth the paper it's written on unless the American fire service, I'm talking about municipal and county fire authorities, take it upon themselves to become the advocates of the installation of these systems.

I can positively guarantee you that in many communities there are firemen around the country today that are not only afraid of this ordinance, but are actively pursuing courses of action to detract from it. There are legitimate reasons for that. There are reasons in terms of fear of losing what resources we do have.

I can tell you that one politician said to me, "If I sprinkler everything, does that mean we can get rid of the fire department?" The answer is no. In fact, hell no! Because there are many other things that a fire department does in a community.

The fire chief then has to become, in terms of 13D, a change agent and has to become more involved as an advocate of this system if it's ever going to become reality in spite of all these tests.

What is my experience and why am I saying this? Much like Bruce here, and we have been communicating across country for a year or so exchanging ideas, my community is a very small town, 27,000 population, half-way between Los Angeles and San Diego.

In the period of the next seven to ten years it will double in size, some 8,000 to 9,000 single-family dwellings that will be constructed in a territory which today is essentially open land. We have opted, after serious consideration, our council sat in on this, we had hearings that took six months, we have opted in our particular area to use the residential sprinkler system concept as one of the elements in our master plan in an attempt to hold down the cost of providing municipal fire protection services.

I have to qualify that because my department is different from many others. I have volunteer firemen. I have 21 full-time personnel and 27 paid call reserve fire fighters. In that respect, the reason I'm here and the reason why I'm participating in this activity is we are caught in Catch 22; that is, if we don't do something now, we will never have the opportunity.

I have got anywhere from five to six years to have any kind of impact on what that community looks like by the year 1985. We have chosen to use the experiences of the previous 13D Committee and to work on options and alternatives that we are using locally, which were developed in a study which we did for our council contained here.

There are a lot of problems in this concept that have not even been addressed here. There are problems that have to be overcome in terms of dealing with fire fighters themselves; there are problems that have to be overcome in terms of dealing with local sprinkler contractors.

I actually had one sprinkler contractor who went to a lady, was going to put one of our systems in and offered to testify on her behalf to get us to rescind the ordinance.

We have problems, already been talked about in terms of the insurance industry, in getting everybody talking the same language. However, in the final analysis and the final comment I'd like to make is, if the Wright Brothers had waited for the Concorde to be invented, we still wouldn't be able to fly.

You have to take certain things and go with them as best we possibly can. Under the given circumstances, I'm willing to take that risk. I have had a couple of brickbats thrown at me and a couple of people think this decision is premature.

If that decision is not made, the opportunity and the option will be removed forever. Rolf.

MR. JENSEN: Thank you, Ronny. Next we have the late Mr. Dosedlo, who is going to give us a little more on the relationship between product testing and the 13D Standard.

MR. DOSEDLO: First, I'd like to thank USFA and Rolf for asking me to participate on this panel at the last minute. And I'd like to indicate that being a member of the NFPA 13D and NFPA 13 Committee's affords me a good opportunity to use the test data and rationale and arguments for putting a lot of the requirements in these installation standards; it benefits me in preparing the product performance acceptance standard for the residential sprinkler.

The way the proposed second edition of NFPA 13D is now written, it references the use of listed residential sprinklers, which obviously are different than Listed available commercial sprinklers. So in the preparation of the draft of this product performance acceptance standard, we plan to incorporate the performance tests using the parameters in the proposed second edition of NFPA 13 and its intended end use, such as the minimum water density, the maximum area of coverage per sprinkler, the available domestic water pressure, and the maximum number of residential sprinklers per compartment or room.

Some other ideas are the need for interchangeability between different models of residential sprinklers. There seems to be some concern by people that if a specific model of a residential sprinkler covers a certain area and a certain density only and it's unique to that one sprinkler, if that model has to be replaced for some reason and no other model by no other manufacturer covers that exact same area at the exact same pressure, this leads to a lot of difficulties in interchangeability.

There's also a concern by some that there should be features in the residential sprinkler that prevent interchangeability between currently Listed commercial sprinklers and a new so-called Listed residential sprinkler.

The test fires in this proposed acceptance standard will be based on time/temperature data developed at LA and FM room fires using reliable, reproducible, and repeatable fire sources which can be repeated week after week and year after year in a laboratory arrangement for manufacturers submitting these for listings.

In this research work there is a definite need to use typical furnishings, couches, chairs, lamps, rugs, paneling, and so forth, to develop the basic test data and response time requirements and water density, but when a testing laboratory has to test manufacturer's products week after week and year after year, it's quite difficult to depend on buying the same couch or the same chair or the same carpeting and so forth because the burning characteristics of these products do change and the same furniture might not always be available.

The sensitivity requirements for the heat responsive element on a residential sprinkler will be almost entirely based on the data developed by the USFA sponsored tests at LA and FM. The mechanical requirements for residential sprinklers, such as the water surge and vibration and rough usage and leakage and corrosion, and so forth, will be drawn from our experience with commercial sprinklers, but will be modified based on anticipated conditions in single-family dwellings as well as multi-family housing, including considerations of using domestic water supplies connected to clothes washers and dishwashers which the normal standard NFPA 13 sprinkler system currently does't have to be too concerned with.

It's a separate isolated enclosed system, you might say, and it's not subject to water surges or water hammers that can be created by a solenoid valve on a dishwasher or clothes washer and so forth.

And the last point I'd like to make is that there's a real need for reliability of operation of the residential sprinkler and some people feel that there's almost more of a need for reliability of operation of the residential sprinkler than there is for the currently Listed commercial sprinklers.

And one reason for that is that, typically, most of the currently installed commercial sprinklers are in multiples, such as in this room or in industrial applications where, if for some reason one sprinkler doesn't function or operate, there's usually others all around it that can operate and take over, while in most or some residential applications there might be only one residential sprinkler or in some cases two, and you can't have the safety of one not operating and the others will take over because you might only have the one to begin with.

So being on the NFPA 13 and 13D Committees does afford me the opportunity to have access to a lot of the thinking that goes on in putting down the requirements, which does afford me the opportunity to use that thinking in putting together the requirements for testing and listing residential sprinklers.

MR. JENSEN: Okay. We have now completed the ground laying, you might say, the preliminary statements. And what we want to do now is open this for discussion. We have a couple of ground rules that we would like to impose on the discussion.

If you have a question or a comment, go to one of the microphones. If somebody is in front of you, please wait in line, don't knock him down, or her down. We would like to preserve order. As far as the panelists are concerned, if we get a question, I will direct it to one of the panelists. I don't want you climbing on the table and fighting for the microphone.

Now, Graham, do you want to start with the first question or comment?

MR. CLARKE: No. I just want to suggest that it might be helpful to briefly review the purpose of this interaction with this audience. Can you do that for us, please?

MR. JENSEN: Our focus here is to get feedback and comments on content, the program, the testing program, principally with emphasis on what's going on in this change in 13D.

Come to the microphone.

MR. ROBERT TAYLOR: (Republic Steel) I have been very quiet so far today, Rolf, as you noticed. But I have a couple of real interesting questions. No. 1 to the gentleman from Underwriters Laboratories. In your practical testing, do you intend to test for abuses of sprinklers which can be anticipated in home use? Things such as painting of heads or hanging of clotheslines and mobiles from them?

MR. DOSEDLO: I assume you mean spraying paint or brushing a coat of paint on the sprinkler head, that would be kind of difficult to reproduce because unless you know how thick the paint is and what kind of paint it is and how often he's going to put it on there, as you know, currently Listed commercial sprinklers aren't anticipated to be painted once they are installed.

Now, there are big differences between the commercially Listed ones which are somewhat maintained and policed by the company's maintenance people and insurance carrier and so forth, which normally probably won't be available once they are in the single-family dwellings.

So you do have a good point about the maintenance and policing of the sprinkler after it's installed.

But we currently didn't have anything in mind to duplicate X number of mils. of paint of a certain kind, sprayed or brushed on to the sprinkler.

MR. TAYLOR: I did not mean it facetiously. When one makes inspections and sees what is done to sprinkler heads and smoke detectors...

MR. JENSEN: Let me interject and read from the standard: Paragraph 3-5.4, "Operated, damaged, or painted sprinklers shall be replaced with sprinklers having the same performance characteristics as original equipment."

The standard makes it clear that a painted sprinkler should be removed and replaced.

MR. TAYLOR: My only point is how are you going to enforce it under the manpower limitations fire departments are facing? That's a very real question.

MR. JENSEN: I think the enforcement is really the more important question. But the point is the standard has been dealt with in the same way it has in the big standard and if you paint a sprinkler, it's suspect.

MR. CASTINO: Can I respond to that? Part of the things that we looked at, Bob, with alcoves and perimeter leakage and things of that sort in the EC sidewall study, deal with your concern.

The other things, like somebody running a clothes line across or changing the design of the room or something of that sort, in my view they are going to have to be covered by the installation instructions on the product. Just like misusing a fireplace, closing the damper when you go to bed at night and not putting the fire out.

We can do all the testing in the world, but if somebody closes that damper, carbon monoxide is going to develop in the home. So you're getting into questions of product misuse liability.

MR. TAYLOR: I know it. Particularly with respect to the invasion of privacy provisions established by the Supreme Court, which makes reinspection of properties and fire investigations difficult at best.

MR. COLEMAN: I'd like to share with you an experience we have in terms of smoke detectors that might address your question. In our particular area, I'm not sure it's available countrywide, but we have a service involving the escrow companies, when homes are sold, a transition type of thing, they automatically make up a change for the assessor parcel information.

A copy of that is always forwarded to the fire department. We have a subscription service. And through a random sampling selection process we contact every property owner once a year through this thing and discuss with them such things as do you know you have a smoke detector.

A lot of them think it's a door chime. Things of this nature. I readily admit that is not a comprehensive program, but instead of sending a fire inspector to the scene conducting physical inspections of this nature, the random selection and contact process through the telephone has been very successful for us. We are actually getting people calling us now and saying, my neighbor told me such and such, should I have the same information?

And we are using the telephone to do a lot of this kind of survey work instead of on-site inspection work.

MR. TAYLOR: May I interject a point of law on this? Last week the Federal District Court in Cleveland affirmed the right of the City of Shaker Heights Building Department to make an inspection in transfer of property before the property can change hands. Shaker Heights vs. Baron's

But this is now a thing that has been adjudicated in law. I don't know if it's going to the Ohio Supreme Court or not.

MR. FRANZ HAASE: (L and F Marketing, Peterborough, New Hampshire) I have a question on the insurance end of it. As I understand, it's the intent of the committee to not only reduce the property damage, but that of lives.

Has the insurance industry been looking at possible savings to claims paid on these loss of lives? If we can save 3,000 lives a year and they all have a life insurance policy of $10,000, there are substantial dollars that will not be paid back.

I wonder if the insurance community looked into this aspect of the possible savings.

MR. JENSEN: I got a feeling Dick Hughey is just dying to answer that.

MR. HUGHEY: I don't know a darn thing about life insurance, except I have it myself. ISO does not make rates for life insurance. I understand rates for life insurance are based on average life expectancy and life insurance is always paid. It's always a loss. It's a hundred precent loss. It has to be. It's inevitable on the surface. The premiums are invested to both guarantee payment of the policy and guarantee income to the insurance company at the termination of life or the term of the policy, whichever is longer.

I don't think you're going to affect the mortality tables of the life insurance companies which are based on, right now, a population of 230 million people by saving even 5,000 people a year. It will take years to influence that mortality table.

MR. HAASE: It just seems the dollars involved, my home owner's insurance I believe is a thousand dollars --

MR. JENSEN: What does that have to do with life insurance?

MR. HAASE: I'm trying to make a correlation between this rate thing, if forty percent of that is for fire, and you gave me five percent, I'm saving twenty bucks a year. It doesn't seem the numbers are there. If we can save 3,000 lives, it seems there's going to be thirty million dollars in revenues that aren't going to be paid out by the insurance company; there's no way that can be reflected back?

That's what I was saying.

MR. HUGHEY: But the premiums are no longer paid on those insurance policies, either. Let's for example say the mortality tables are for seventy-five years. That contemplation in an ordinary life policy payment of premiums for seventy-five years or sixty-five or whatever the term, ten year paid life policy.

But I really don't know, I'm not in that life insurance rating business.

MR. HAASE: Thank you.

MR. DAVID MOORE: (Research Division, NFPA) I'd first like to suggest that we are basing this ninety percent success rate on an industrial environment, and the residential environment is very much different. Also, we saw an unsuccessful fire in the LA test involving closets. This was understandable because the fire had a very small unprotected compartment and could get a significant head start on the sprinkler system.

So it seems like the answer is to install sprinklers in all small apartment compartments; realizing this is not cost effective, there has to be another solution. NBS did some testing where they found that the sprinkler would control a fire within a closet of a given volume.

I think that we have a very good test series, but rather than to leave a loophole by saying that small spaces, including closets, should not be sprinklered, that we perform some actual fire tests, where we vary the volume of the compartment with a sprinkler outside of the compartment to determine what is the minimum volume that can successfully control the fire under the 13D proposed standards.

MR. JENSEN: If we can get the lights out, you can look at what the new exceptions are. The reason I put this up is these are the new exceptions that are in the proposed 13D. I don't know how many people have even seen it here other than the committee members.

The top says simply location of sprinklers and it says, as the basic rule, sprinklers shall be located in all areas. And then it is followed with a number of exceptions. The first one is bathrooms. It says, "Sprinklers may be omitted from bathrooms not exceeding fifty-five square feet with noncombustible plumbing fixtures."

I can find a house somewhere in the country where somebody puts fifty-five pounds of polyester clothing in their bathrooms. Therefore, we shouldn't omit sprinklers in bathrooms. I can take the same logic with anything. I admit the committee was playing cost benefit tradeoff on these.

And the committee, I think the point I would make for the committee is that what you heard this morning about that closet was not new information to the committee. We knew that.

MR. COLEMAN: How big was that closet? I don't think it's ever been mentioned.

MR. JENSEN: That particular closet would have been sprinklered. It was bigger than this exception provides for, but that's not the point. Even if it was smaller, the amount of combustibles that he had in that closet under his test scenario in Los Angeles still would have produced a fire great enough to give him the same result.

I think that's the point Don Manning was making, the dimensions of the closet weren't that all fired important, it was the result that concerned him, the amount of fire that came out of it when there wasn't a sprinkler in the closet.

MR. COLEMAN: But he said when he ran the second fire the results were appreciably different.

MR. JENSEN: When he had a sprinkler in the closet. Okay. We know that. It's no surprise.

MR. CLARKE: I would just like to address this closet thing because I think there are some misconceptions surrounding it and the way the 13D Subcommittee is reacting to it. We recognize, as Rolf pointed out, that a fire in a closet is a very impressive event. We have seen the films and the slides and all that kind of thing.

And essentially having a fire in a closet, not having a sprinkler, is similar to having an oven or a furnace with a door opening into the room. There is no doubt about it. There's all kinds of reradiation things going on in the closet while the fire is happening and there's no protection in there.

The committee does understand there is a problem just as we understand that there's also a problem in the attics, which we are allowing omission of sprinklers from, in unattached garages, and in other similar type places.

What we are trying to focus on again is the low-cost feature, the low-cost factor, and we have looked at the areas where fires don't occur statistically. So we are playing, what, a statistics game, we are playing the odds, but we think that we are taking the right kind of chances in trying to produce a standard, a document that will in the long run and short run and medium run pay off.

MR. JENSEN: Any other comments from the panel? Okay, next.

MR. SABHLOK: (Building Code Action, California) I have two questions and a comment. My observation is that I probably have attended more local city council meetings on sprinkler ordinances than anyone in this room and, from that observation, I would say the model described by the insurance gentleman is one that prevails.

There is no need for approving of anything. It works. That's the presumption at the local level to the point that some fire chiefs have guaranteed that NFPA 13 in residential guarantees the life safety even in the room of origin of fire as a sales pitch for a sprinkler system.

There has been lots of discussion about the cost effectiveness, and I either have not looked hard enough or just the data seems to not exist, it could be one of the two, but I have never seen a conclusive cost effectiveness study of sprinkler systems that shows that the sprinklers will pay for themselves with the assumption that one has to have a rescue force in a local community, unless we want to completely eliminate the rescue.

At that point we have another situation I'll discuss that, maybe not at this point, but my studies have always shown that it is not cost effective, especially when you consider Proposition 13, that says no sooner do you put in a bigger sized water meter, you're going to pay a connection fee that has nothing to do with the meter cost; it's the cost that they are going to have to bring in the mains or whatever the next size is. The water supply system is an extremely, enormously exponential curve that takes the water meter cost connection fee much higher.

I would like to know from the committee how they handle, in the cost effectiveness studies, this type of data. And two is, how do you propose to deal with the grease fires? There was a study in Fresno, California, that conclusively showed the biggest problem was grease fires in kitchen areas in the State of California.

MR. JENSEN: Who wants to comment? Get off the table.

MR. HISLEY: I'll address that first on cost effectiveness. If you don't consider saving five million dollars in twenty years as being cost effective. I don't know what else you can prove. That's a lot of taxpayer money. That's only one item. It's not cost effective for the thousand people that have to put the system in. But it is cost effective to the existing taxpayers that would have to pay for constructing a new fire station.

We are looking at some other possible benefits right now in zoning. One is set back requirements that now exist. With a change, the builder would be able to construct more structures on a given section of property. That's just an alternative to look at. I'm not saying it's going to fly, but it has possibilities.

The other one is water supply. I'll mention that we have a situation where our facility ordinance was passed, but we have certain areas of the county that have old water systems and they cannot deliver the water required by the ordinance. This has caused serious problems for us.

If we have fires and don't have a basic fundamental thing like water, we are in real trouble. We said to a developer who wants to come in, you have two choices, upgrade the water system so it can provide the gpm flow we need for a particular project or consider sprinkling the structures.

Cost analysis is this, he looks at the two alternatives, the cheapest route is the one he's going to take.

I'm talking about possibly installing maybe 10,000 feet of new water main, this type of thing, installing a million-gallon elevated water storage tank. After the builder puts this in, he doesn't have anything to show for it. He has to pass this cost on to his development itself. If he puts in residential sprinkler systems, at least he has something to show the buyer for the extra cost he puts in that building.

That's some of the cost estimates that you have to work on.

MR. COLEMAN: I think another aspect, I'd like to pick up on what the gentleman said about fire chiefs making promises. I think it's suicidal for a fire chief to stand in front of a city council and promise anything in terms of a fair exchange. You give me five more men and I'll cut the fire loss in this community fifty percent next year.

In terms of the approach that I took in development of our program, I never promised anything. All I did was tell them what the possibilities were and couch the approach in these terms. I know what the long-range options are if we don't do anything, and that is a continuation of the curve that I currently can demonstrate over the last ten years and predict over the next ten years.

In terms of cost analysis, I think, like Bruce said here, it's very important that fire departments, or people who are involved in this field, not make rash statements about how it's going to save all sorts of money, because there's a damn good possibility that we are not seeing these huge savings we are talking about.

I think there's a moral aspect of this that I can't put on the table and I can't prove, but when I took this job of being a fireman, my job was fairly well structured to save lives and property and nobody ever gave me a budget to to work on as to how many I could afford to lose.

The real issue when it comes to cost benefit has to be handled almost on an individual basis as to dealing with individual tracts. I have one building for example that's six stories tall and every floor is a ground floor, built on the side of a cliff.

In order for my combat forces to get into it, it's like fighting six stories of basements. We have a New York City fireman here and I know he understands what I'm talking about. When you're dealing with these kinds of issues, it's not very difficult to give a dollar and cent value and then promise to save money.

What you do is keep from losing what you've got.

MR. JAMES P. GOURLEY: This morning I heard it said that the subcommittee was proposing home sprinkler systems for life safety aspects. I would be curious to hear the committee's response to an ordinary citizen's question: Why should I install a sprinkler system when just last year you were emphasizing installing smoke detectors as a means of saving my life and getting me out of the house?

MR. JENSEN: Not this committee. This committee has never advocated installing smoke detectors. Good heavens, we don't even recognize they exist.

MR. GOURLEY: Answer the ordinary citizen's question, a question that the contractor will get if he tries to sell his sprinkler system: Why should I install a sprinkler system when I have smoke detectors? I know as a fire protection engineer the importance of a sprinkler system.

MR. JENSEN: I think the answer to that question comes out of the Johns Hopkins study, which Mr. Shaw referred to in his talk this morning, where he pointed out that the reduction or the probability of having your life saved and having an improved reduction is far greater with a sprinkler, with a properly designed sprinkler system, than it is with a smoke detection system.

MR. GOURLEY: If the figures are there, that should be emphasized.

MR. JENSEN: They were on the slide this morning.

MR. HUGHEY: I think in all fairness to the public asking this, we shouldn't say that it's a great difference. I think the Johns Hopkins study showed eighty-two percent with the smoke detectors and eighty-eight percent with the sprinkler system.

MR. JENSEN: Ninety-two or ninety-five. That much of a difference.

MR. HUGHEY: It's a fairly narrow difference when you compare it with the success of either one individually. But the success is that if you have drinkers in the family or you have incapacitated people in the family, you want an extinguishing agent in the house as well as an alerting device.

And, of course, being property oriented all my working career, I'd like to have a house to go back to after I run out. And while you can't prove all of those by dollars and cents or percentage statistics, there is a difference between the two effectiveness-wise, and it lies in the fact you have nonmobile occupants in the house.

MR. HISLEY: One more comment about your question. That same question was brought to bear in testimony when we tried to get our ordinance passed in the County, the very same question. The council said you told us detectors were going to be the answer to the life safety problem in residences; now you are asking for a sprinkler requirement in areas beyond a 5 min. response time?

It was hard, it's not easy to address. You know, you're not going to downplay the smoke detector requirement because it's proven to be more than worthy.

However, I'll mention that Johns Hopkins report shows eighty-eight percent probable savings with smoke detectors and ninety-two percent with sprinkler suppression systems. That's four percent difference. It is a narrow gap.

They say you're spending less than a hundred dollars for smoke detectors and a thousand dollars for sprinklers. It's a big step up. The thing I have in my mind is what is happening with smoke detectors right now in our County and the Country as a whole. We are on a tidal wave of smoke detector effectiveness. We may have a problem in the future because the public may not maintain the detectors which would mean failures.

The Public is putting them in, it's on the bandwagon, and they are not going to maintain them. A certain amount will. Unless we educate the public, a whole bunch of these things are going to be sitting there not working and we are going to start getting fatalities in these structures with smoke detectors in them.

I believe the sprinkler requirement is more from the standpoint of maintenance, and that was one of the facts we used in saying maintenance was not a problem with sprinkler operation. If the system is not shut off there is an excellent chance of having the fire controlled by a 13D system.

But it's a tough question and something that has to be addressed if you're going into something like this.

MR. CLARKE: These Johns Hopkins numbers are being bandied about quite freely, and I've heard those two numbers, eighty-eight percent and ninety-two percent, probably ten times in the last twenty-four hours. It's not legitimate to cite those numbers without citing also the qualifying statement made in the Johns Hopkins report, namely that the life saving benefits of an alarm system are predicated upon proper response from the occupants.

And I think we know that that is less than an ideal situation in real life.

MR. JENSEN: All of those are predicated on proper response and a fully operational system.

MR. CLARKE: This is true. But as somebody said yesterday, a residential sprinkler system is the air bag of the fire protection industry. It's a passive kind of thing and in theory you can just lie back and let it help you. The alarm system obviously is a whole different ball game.

If you don't react properly, then you're not going to be part of that eighty-eight percent.

MR. JENSEN: That air bag comment was a good lead-in for Ed Reilly.

MR. REILLY: Thank you, Rolf. I'm President of National Automatic Sprinkler and Fire Control Association. I want to address this question to Lee. During the course of your remarks you referred to the existence of the new residential prototype sprinkler as allowed in 13D at this time to be located on the same system that a conventional sprinkler would be located.

For example, if the room beyond this room were a sleeping room on the very same branch line you could have located a residential sprinkler that differs in characteristics in many, many ways.

Now, one of the things that confused the manufacturers a week ago was a result of this co-mingling of the residential and the listed sprinkler in the same system. The hydrostatic test, the 300 pound test, 500 pound test, 875 pound test, the other tests that have to do with the strength of the fusible element, we have been under the impression that they would be different, because as we reduced the thermal mass, as we reduced the mass of the fusible element, make it smaller so that it can absorb heat more rapidly, it begins to lose its strength in a direct ratio.

And we are wondering what the philosophy is in the laboratories with regard to the reduction of the hydrostatic requirements, of the structural requirements, as they affect this new residential sprinkler. Could you elaborate on that a little bit.

MR. DOSEDLO: Yes. Well, as I mentioned earlier, a product acceptance standard is intended to track the intended end use of these residential sprinklers as described in NFPA 13D. And in the current edition of NFPA 13D, which is entitled One- and Two-Family Dwellings, I believe, I guess the intent there is to use a somewhat low-pressure system, I guess either domestic water or stored tank.

But in this proposed second edition of NFPA 13D, it goes up to multi-family units, up to four stories in height. In reading from paragraph 1-1.1, it says "Sprinkler systems installed in nonresidential areas shall comply with all provisions of 13." So my understanding of this is if you have a four-story building with common use areas, such as corridors and stairways and possibly attics or something like this, that would normally require a standard 13 system in it, then for your individual dwelling units you could tap off of that sprinkler piping and then screw in Listed residential sprinkler heads in a dwelling unit.

Also there's a paragraph here that states: "All systems shall be tested for leakage in normal system operating water pressure. Exception: When a fire department pumper connection is provided, hydrostatic pressure tests shall be provided in accordance with NFPA 13."

So I guess you're saying when you have a four-story building with a fire department connection, then you should hydrostatic your whole system per NFPA 13 rules. And for these reasons in the product acceptance standard, we didn't seem to have much choice other than to require the same type, the same values of pressure tests as for currently Listed commercial sprinklers if they can, and are going to be, screwed into a 13 or branch of a 13 system.

So that's what is behind it. If they could only go on domestic water supply systems, which had some upper limit on the pressures, then we could possibly consider lower values for leakage requirements and strength requirements.

MR. REILLY: This was discussed among the manufacturers at this engineering meeting last week. Among ourselves, and the industry, there is no knowledge within the industry at this time as to how to design to reach a T (Tau) value of twenty-one, get the distribution and time response, and at the same time get the structural strength and hydrostatic requirements.

In effect we are leading up to three kinds of conventional sprinklers. The sprinkler we have here, the one that applies to multiple-dwelling units up to four stories connected to another conventional system, and then a third generation which really hasn't been thought about before and hasn't been talked about before, but we are leading up to a generation of three families of sprinklers with three different sets of characteristics.

The middle group that I'm talking about at this present time has simply matched the state of the art and the technology of the manufacturers. So it's become an impediment to progress in that particular technical level, in the design for that particular kind of an occupancy.

MR. HUGHEY: Well, I guess we are both saying the same thing. I mean, if the rules in 13D allow for the condition that a Listed residential sprinkler can be attached to a height that's in turn attached to a 13 system, you don't have much choice other than to require similar requirements for hydrostatic strength.

If you put an upper limit on the anticipated working pressure with domestic water or something, I guess lower leakage pressures can be considered.

MR. REILLY: Seems to me there's one of two possible solutions. Either 13D has to change or 'Laboratories' has to change. Otherwise we have reached an impasse on this middle ground occupancy.

MR. JENSEN: I think your discussion is becoming one that rather involves unique parties and I would suggest that you carry it on as well on the side. Ralph Jackson, did you want to come up and comment?

MR. JACKSON: I just wanted to comment that the role of the municipalities in helping the residential sprinkler concept to go forward has precedent. It was considered absolutely ridiculous twenty years ago when cities were first considering the problem of traffic patterns near downtown areas that they should impose on the contractors the problem of providing off-street parking. And yet this is a very common practice today and the inner cities haven't died as a result of it.

Contractors found they simply jacked the building up and provided parking underneath it. Yes, it did cost more money, but the buildings were put up, they are rentable and occupiable, and it's a solution to a very serious municipal problem of keeping the traffic moving so that the downtown didn't die.

I think we are facing a similar problem here where the municipality will have to take a leadership role in the implementation of residential sprinklers.

MR. COLEMAN: This is a little bit far afield, other than the fact that my hobby is a history of the fire service. I collect antique fire equipment and so forth. I noticed an interesting trend in the field of fire protection that's gone back over at least two hundred years that I know of.

It has to do with the acceptance of technology because if you study the examination of the acceptance of almost everything from horse-drawn fire apparatus to steam engines to motorized apparatus, it goes through the stages of: it won't work, it might be possible, I can't do without it.

You can compare that to almost everything that's ever been developed for use in our particular field. I can equate it to apparatus, to the twenty-four hour work shift for firemen. I have a document in my file right now from the International Association of Fire Chiefs where a chief officer made the statement that if you put firemen on a twenty-four hour work schedule, it will kill the American fire service.

That was made almost a hundred years ago. And another comment - a chief repeated the same comment a year ago about the eight hour work day. That's where I see the residential sprinkler problem; it may be possible. In another ten years I don't think we will be able to do without.

MR. JENSEN: I thought you were describing my wife. That's what bothers me about that comment.

MR. TAYLOR: Rolf, I'd like to speak this time as chairman of the ASHRAE TC 5.6 Committee on control of fire and smoke. Before I do, a little aside. The 100th Anniversary Book of IAFC verifies what Mr. Coleman says is true.

Many techniques that were proposed 100 years ago are still being debated or finally just being accepted.

Basically, everything that I have heard discussed has been designed by hydraulic engineers and people involved in fire testing. I think it is time and I would like to suggest and make the offer here, that members of our American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Committee TC to be involved in the control of fire and smoke start working closely with your technical committees. This because it appears that a number of common techniques of heating and air conditioning in structures that will seriously affect life safety are not being considered or addressed in the current testing procedures that you are using as a base for this standard.

For instance, the normal method of hot air heating of houses is different from the type, I believe from what I have read, of methods of ventilation that you are using in the fire testing.

Further the room air conditioners--

MR. JENSEN: Whoa, let's stop right there. The ventilation in the fire test had nothing to do with normal heating of a home. It had to do simply with a window being left open.

MR. TAYLOR: That's what I'm saying, Rolf. I'm saying there are parameters, particularly in the northern part of the United States, where the heating system in a house, particularly if it's an air flow or blower system, can affect the air dynamics, smoke movement and heat flow dynamically.

These things should be considered in the testing procedures.

MR. JENSEN: They were in the Factory Mutual smoke ring test.

MR. TAYLOR: From what you say, this can be true. But I have not seen such data. Now there is also the air conditioning problem. What is the effect of room air conditioners on the fire and the effect of central air conditioning. What are the problems of cold ceilings and cold air flow on ceilings. These are all serious factors that can influence the operation of a sprinkler system that has not been adequately addressed in the public reading to which I have access. Likewise, smoke in such situations and above the developing fire is not adequately addressed.

MR. JENSEN: Anybody up here want to comment on that? Kung, do you want to comment on it?

DR. KUNG: No.

MR. JENSEN: Kung doesn't want to comment on it.

MR. TAYLOR: Our committee will be glad to help you resolve it. I think it's time we joined hands in this particular area and came up with some combined solutions to some real problems that not only exist in homes but high-rise and commercial buildings as well.

MR. JEROME S. PEPI: (Grinnell) I'd like to address myself to the general use of the phrase 0.1 gallon per minute per square foot or some other arbitrary density--

MR. JENSEN: Rate of water application. Density is a term that turns me off in this business.

MR. PEPI: I'm glad you said that. I'd just like to simply point out for the rest of the members of this group that are listening to the proceedings that it is a great misnomer in the area of residential fire protection and I would ask the 13D Committee to consider its rewording of the use of the application of the flow of water to the fire.

For example, in one of the fire test movies by Jack Rhodes, it showed the drapery fire in which case the level of water impinging on the wall was of great importance. In addition to that, one of the fires of the LA Fire Department showing the chair and the lobbing action of the water over the back of the chair behind high-boys, etc.; in natural circumstances there may only be sixty percent or seventy-five percent of the water going on the floor.

So, really, the standard, I would suggest, should refer to flow per head for a certain sized room of coverage rather than the density per square foot.

Another--

MR. JENSEN: Can I stop you before you get on to another point I'd like to hear probably--

MR. PEPI: On the same point, just by way of illustration. For example, 13D now stipulates 150 square feet, but seven and a half feet off the wall. Let's suppose you have a room of a hundred square feet, 0.08 density, but because of a lighting fixture, whatnot, the designer locates the sprinkler seven and a half feet off one wall.

So now that far corner receives extremely poor coverage at that eight gpm rather than the fifteen gpm that would have been needed to properly cover a corner that was seven and a half by seven and a half feet using perpendicular walls.

So I would point that out to the committee also as another reason why really flow per head for particular distance off the wall for a sprinkler or area coverage really should be the criteria rather than density. I solicit your comments.

MR. JENSEN: Any of you want to comment?

MR. CLARKE: Yes. Jerry, you and I discussed this before. I certainly agree with you. I think the term density is particularly inappropriate in this standard and I have no problem with inserting some other more appropriate term. And it is less than academic. It is not particularly a matter of semantics.

In the cases where particularly there's a single sprinkler in a room, in that case thinking in terms of gpm per square foot and that square foot is universally understood to mean square foot of floor area, it loses its meaning. Because the sprinkler is required to do more than that, flow water on the floor and on the combustibles above the plane of the floor. All I'm saying is I agree.

MR. JENSEN: Let me add just a comment to it. I have a concern that, whether you handle it simply as density or by some other means, it could have the potential of leading to the gross oversimplification of a very complicated problem.

After the test of August 29, 1978, where we had our notorious failure, we went out into the test room at Factory Mutual as a committee, and Kung I think will remember this rather well, and we looked at the operating characteristics of the sprinkler. We visually looked at it; we didn't make any careful scientific measures of where the water was going, at different water flow rates and at different orifice pressures, and it was quite clear that the degree of uniformity of the discharge pattern was extremely variable.

Now, I don't know how that will ever be handled in the installation standard. It's something that is going to have to be handled, as I view it, in the test standard for the product. It seems to me that if there is a degree of uniformity of distribution of that water obtained, then spacing limits can be assigned and you can work on some kind of an average water application rate basis.

But one must be extremely careful in the fire testing and in the analysis of the Factory Mutual data and of the Los Angeles fire test data, that the application rate that is or is not putting out the fire or controlling the fire is in fact what you thought it to be.

MR. PEPI: I agree with your point completely because let's say as you drop down from, to pick a number, fifteen gpm down to twelve to eight, not only do you decrease the density on the floor, you pick the water off the wall and its trajectory decreases, so that drapery fires begin to become a problem.

Before I give up the floor, I want to comment on one item that a previous question was raised about - grease fires. And what about kitchens? It's one thing to throw a pot of water on a grease fire, and we all know what happens.

But in some research work that's being done by Grinnell, we found that soft water droplets or fine spray on a fat or grease fire can actually be a relatively effective fire suppressant. As long as you don't hit it with too high a velocity and splatter the grease, you can stifle out the oxygen and have some reasonable fire control.

MR. JENSEN: Is this data that is more recent than the work that was done at Grinnell? My recollection is this may have been eight or ten years ago, when we first put some material in the sprinkler standard on grease fires and sprinklers.

MR. PEPI: This is work done by Grinnell about two years ago.

MR. JENSEN: Is it published?

MR. PEPI: No, except it was done for a private restaurant company and developed into deep fat fryers. But we have done additional work since then which simply points out the very great effect that the velocity and size of the water droplets have on the ability to properly control a grease or fat fire.

MR. JENSEN: Let me inject just one little personal comment on your data. My comment is simply this: I would encourage you, Underwriters Laboratories, anybody else who does test work that has wide application and value within our business, to publish it wherever possible wherever you don't have some kind of a confidential need to suppress it.

It's disturbing to me when we have to reinvent the wheel and somebody stands up and said we did that three years ago.

MR. HUGHEY: I think Don Herbsman with Burger King was responsible for some of this testing for suppressing fires with a small orifice sprinkler. And he might be saving the material for an NFPA speech one of these days; I don't know.

MR. STILLMAN: Gave it already last fall in Montreal.

MR. HUGHEY: This is newer than that. This is a fairly recent experiment with small diameter sprinklers. I think Don would not be opposed to sharing this if we can get him to bring it out in the open.

MR. PEPI: I don't want to express too much optimism. We have had successes. We have also had less than success. The point is that we want to stipulate if you put too high a water velocity combined with too high a drop size, you can create quite a fireball in a fryer.

But proper load density can do a very effective job.

MR. HUGHEY: No wonder Don Herbsman didn't call me back with reports of the test.

MR. CHENEY: (Fire Protection Engineering) I have been on the contractor side of this for better than twenty years and I came here perhaps with the understanding this might be a new area that a small contracting firm could move into.

MR. JENSEN: Slowly.

MR. CHENEY: Very slowly. But from a marketing standpoint, since I have been here today, my observation is we don't have the standards ready and we don't have the sprinkler head developed, so we better set that back.

But a couple of observations, if I may, that I picked up from your conversation. The sprinkler industry survived because of insurance savings in the commercial and industrial buildings and then survived because we had a tragic fire in Chicago back in the 1950s. And when Our Lady of the Angels burned, injuring a lot of children and nuns, we sprinklered schools throughout the country.

We had high-rise fires recently in New York and we now have high-rise legislation and state building codes. If a man cannot invest $900 to put a sprinkler system in a home which may be worth thirty, forty, fifty thousand dollars, then it appears that I have a real doubt that we have a market unless we legislate that market.

I don't see the insurance consideration and I can understand not getting insurance consideration for a home sprinkler system. But do you gentlemen feel that we will have a market unless we legislate it?

MR. JENSEN: I sure as hell hope so.

MR. CHENEY: I have been a peddler for all these years and I'll be very happy to sell this microphone. If you tell me how much it costs, I'll go out and sell it. But in this particular case I don't see this necessarily as a saleable item.

MR. COLEMAN: I know Ralph made the comment he certainly hopes we can sell this thing. I have to honestly admit I don't think this kind of concept is going to go far down the road unless people take a position of advocacy, which includes legislation. I can honestly tell you right now, as I'm sitting in this room, of over 1,000 residential sprinkler systems in the Orange County area.

I know those have several things going for them. No. 1, we have already had three fires, none of which matched the scenarios of the tests. One of them was four separate arson fires on one particular occupancy that hadn't even been occupied by the people yet.

I really and truly believe there is going to be a market, but I think it has to be developed in concert with communities that take the residential sprinkler concept seriously and make it part of their local fire protection system.

MR. JENSEN: Thank you. Let me take just a moment to wrap up. We are at five o'clock and I was admonished to finish at five o'clock and I'd like not to run too far into your adjustment hour.

I think you have heard a great deal today in terms of some of what has been going on in the last year or so in residential testing, residential sprinkler system testing and evaluation, and what is going to be occurring in the next year or so, a little about the programmatic content of the long-range picture, and a bit about what's happening from a standardization viewpoint.

To my mind it is clear that where we are is at a point where a few very critical things must occur, hopefully all at about the same point in time, if we are going to move forward.

One, the LA tests and the related mobile home tests are going to have to be carried forward and develop the validation data to go with the draft proposed revision of NFPA 13D that's now in process. If it does not totally develop it, then obviously it will have to be modified consistent with the data.

Second, in order to be able to get a fast response residential sprinkler on the market, the testing problems of the product are going to have to be worked out, and that means that the industry and the approval laboratories are going to have to find a common acceptable ground.

The third thing is that, based on that common acceptable ground, we are going to have to complete the development and be in a position to produce so it's a saleable item - the real product.

Now, from my viewpoint that's a tough time line. We are trying like heck to get a lot of people interested and encouraged to see if we can hit it by the end of 1980. I would have to hazard a guess, and I think I heard a lot of people say it, that 1980 is optimistic at best.

SESSION III - IMPACT

Anthony R. O'Neill

Assistant Vice President - Technical Operations

National Fire Protection Association

Moderator

Good morning, ladies and gentlemen. I'm Tony O'Neill with the National Fire Protection Association, and I will be your moderator this morning to introduce our guest speakers.

This begins the second day of the Conference on Low-Cost Residential Sprinkler Systems, and I welcome those who were not with us yesterday and I'm glad to have you with us today.

Yesterday we heard about the new technology that will make such a low-cost residential sprinkler system possible - the Factory Mutual Room Fire Tests and the current Los Angeles Fire Tests on a full-scale basis in a real life dwelling.

Yesterday afternoon we heard about how this new technology will be implemented. I say will be implemented because I have confidence that that is what is going to happen.

We talked about the NFPA committee activity that develops the performance and installation standard. We talked about the UL and Factory Mutual acceptance standards.

We will start off this morning with a discussion of how this new technology will impact the various segments of interest in this subject, the fire service, fiber textile manufacturers industry, the building industry, and the insurance industry.

To begin our discussion and following the protocol of yesterday, there will be no long introductions, but to begin the discussion this morning, I have the pleasure of introducing Chief Andy C. Casper, Chief of the San Francisco Fire Department, who will give us his thoughts on the fire service viewpoint.

Andy.

THE FIRE SERVICE VIEWPOINT

Chief Andrew C. Casper

San Francisco Fire Department

When asked by Ken Backman to speak on the fire service's view or opinion of low-cost residential sprinkler systems, I was told that the title would be of my choosing and could be an exotic one. Truthfully, there is no need for an exotic title. You gentlemen (and ladies) are much more versed in the technology of the art than I am. You have high credentials in fire protection engineering and related industries. Many of you represent manufacturers, builders and insurance companies. All of you have been working and meeting for years attempting to reach the very worthwhile goal of developing low-cost residential sprinklers so that the severe life and property loss in dwellings across the nation will be drastically reduced. You gentlemen (and ladies) have the expertise required to analyze statistics and test results. The regulatory impact is and will continue to be influenced by this group. No, I am not going to attempt to convince you that my knowledge of the subject parallels yours or that I am going to provide informative insights as to new developments or breakthroughs.

What you are going to hear is constructive criticism that stresses the urgent need for this group to somehow move this program more swiftly. To get it out of planning and testing phases. To somehow reach the level of implementation for this very fine program because from my view as a Fire Chief of an old, traditional metropolitan city with an extremely high fire potential, progress has been much too slow. And San Francisco is not alone. Just look at where the majority of fire deaths are occurring in America. You understand. You have studied this national tragedy for a long time and know that mostly it is the residential fires that are the principal killer whether occurrences are in small rural areas or large major cities. We are asking for a quickened pace to offset the fire deaths.

This is how the whole situation looked to us while outlining the need for quicker development and implementation. For most of the 1970s, we in the fire service, and those who support us, have been talking about low-cost residential sprinklers. The 1972 report of the National Commission on Fire Prevention and Control, called "America Burning," a publication I am certain you are familiar with, talked about the need ". . . cheap, aesthetically acceptable automatic extinguishing systems which are adaptable to existing homes as well as new construction." That was 1972. This is 1979, and what has been done? The answer is pretty simple: from the research, planning, and testing aspect - great strides; standards have been formulated; meetings and conferences held; but for going further, not much. Where is the mass installation of reasonably priced residential sprinkler systems taking place? Oh, possibly in some new construction in affluent areas of this country but nowhere in areas that have the highest number of fire related deaths.

We have gone through the better part of this decade talking and thinking about the problem . . . still defining the rules . . . still drafting charts and conducting experiments while Americans die in their homes.

We are not talking about any far-out demand for an advance in technology. Your technology is already there. Americans want the protection. You need only to look at the sales of smoke and heat detectors for home safety to see that. However, we in the fire service are still trying to strike a balance between those who build the homes, those who construct the furnishings, those who live there and those of us who have to put out the fires and carry the victims of these fires away. The victims are the people we are supposed to protect.

Considering protection, every new fire fighter learns the mechanics of water flow. There are charts and graphs as well as statistical data to tell us how much water from sprinklers is needed to put out a fire. We know what types of detectors are best for telling a family their lives are in danger. The statistical data and reports are telling us that. However, now we have to figure out how to get protection for the people who live in the estimated seventy to eighty million homes in America that need to be outfitted with protection devices and sprinklers.

This may be termed by some to be a national disgrace and we should all accept the blame. Maybe this is why the United States leads the world in fire deaths. For some reason we don't seem to care enough to make sprinkler system installations in private residences a hurry-up top priority.

It doesn't take charts and graphs to tell us about the problem. Ask me or any other professional fire fighter in the room. Ask any insurance company investigator. We all agree to the problem.

I read with a great sense of concern a report Joe Redden of the NFPA passed on to me not too long ago. It is an excellent report, properly documented by the Applied Physics Laboratory of Johns Hopkins University. The report is called "Assessment of the Potential Effectiveness of Fire Protection Systems on Real Fire Incidents." The researchers investigated seventy-one fires in the Washington, D.C. area. Here are the statistics . . . please listen carefully.

In those seventy-one fires there were 112 fatalities, three of them fire fighters. There were 119 persons injured, including forty fire fighters. Damage in the seventy-one fires came to just over two million dollars.

The final irony of the Johns Hopkins report, after going over the research material, is that 103 of the 112 fatalities would have been prevented if the fire protection system used as a model had been installed in the homes of the victims. When we talk of victims we should really say dead people, because that is what they are . . . dead . . . and low-cost residential sprinklers could have prevented their deaths.

The Johns Hopkins report gives us the empirical data needed to back up what every fire fighter already knows. But the time for writing reports has ended, and it's time for us to start figuring out how to get sprinklers and detection devices into every new home built in the United States, and how to retrofit those seventy to eighty million homes already built. That is our challenge and now is the time. Not tomorrow, or next year, but now.

Gordon Vickery is saying the United States Fire Administration is pushing for a 50 percent reduction in deaths from residential fires. As you know, testing is going on right now in Los Angeles to develop a sprinkler head for residential use which uses less water and will go off quicker even in ventilated fires. Those tests continue and we in the fire service should watch very closely.

Assuming this is the breakthrough we all want and it is bringing low-cost sprinkler protection to the American home, what do we do next? It appears with this thrust that all existing federal standards for household fire warning and automatic sprinkler protection have to be re-evaluated. Perhaps federal and NFPA standards have to be combined. All of this takes time. Precious time we can little afford.

Progress, however, is being made now that the United States Fire Administration has been able to move in on the act. The agency, as we see it, is pulling fragmented research and testing efforts together. This makes sense. The Fire Administration as an umbrella will effectively stop too many people, in too many places, from squandering too much time and money on uncoordinated test studies. Citing the Los Angeles test as an example of this, we see the USFA funding the tests; the NFPA, the principal investigator, coordinating Chief Jack Gerard's department in conducting the tests; and the work of Factory Mutual Research in instrumentation and analysis. Such methodology is strongly positive but, again, from the fire service view, we hope much additional time is not lost. People are still burning to death every day in residential fires.

Another aspect of low-cost residential sprinkler systems that is bothering the fire service is the persistent rumor that there will be trade-offs with special interest groups in the home furnishing industry. These trade-offs would allow for the lowering of standards for home furnishings with the installation of residential sprinklers. If true, this is bad and any such move should be blocked. After all, why install expensive sprinklers in a tinderbox? Effective fire prevention, coupled with building codes and sprinklers, make for safer homes; but why fill that home with flammable materials? With the Los Angeles Fire Department tests showing flashover temperatures of 500 degrees in a living room scenario, we cannot continue to allow heavy fire loads in homes. Not even with a viable residential sprinkler program. On this matter, fire service people will be keeping a very close watch.

I realize that I am not here to present you with a preponderance of fire service viewpoints. As Jack Webb used to say, "Just the facts, ma'am." And this is what I have intended doing but before I commence my closing statement, I must touch for a moment on interior fire combat, including residential fires. Recently, a fire chief from a very small but extremely wealthy city said that manual fire combat is antiquated, dangerous, and expensive. The Chief emphasized that his remarks were a plea directed at the fire suppression equipment industry to develop a low-cost sprinkler system that will be economically feasible to install in every new structure built, as well as retrofitting existing structures. His plea should be heeded while at the same time understanding that interior fire combat is indeed dangerous and expensive. Presently, however, it is not antiquated because we still lack the necessary residential sprinklers that are so badly needed. Until we have them, fire fighters will continue risking their lives and being injured when making very tough, punishing, interior, direct attacks on our major common enemy - fire.

In closing, it was a pleasure to have this opportunity to present the fire service viewpoint. We consider this U.S. Fire Administration and National Fire Protection Association Conference helpful, informative, and productive. Headway is being made. Even so, the fire service is saying - speed it up! We can't wait another eight years. Far too many people are suffering and dying in residential building fires.

Thank you.

MR. O'NEILL: (Moderator) We have a couple of minutes between speakers. If anyone has any questions of Chief Casper, we would be glad to entertain those now. We will also have a question and answer period at the end of the morning session, time permitting.

Do we have any takers now? If not, I'll move on to the next speaker this morning, who is Mr. Wells Denyes, who is the Washington representative for Eastman Kodak Chemical Products, Inc. Having been a Washington representative myself, I share with you your interesting career.

The only thing is, I only lasted three years. How long have you been in Washington, Wells? Wells will go on up until the time of our coffee break around 10 or 10:15 for any planning purposes in the audience and we will also take questions and answers after his talk.

RESPONSE FROM THE FIBER INDUSTRY

Wells Denyes

Chairman of Technical Committee

Man-Made Fiber Producers Association

Thank you, Tony. Good morning. I just looked at my watch. Let me assure you I'm not going to stand here until 10:15. I'm here today representing the Man-Made Fiber Producers Association.

MMFPA is a trade association composed of manufacturers of more than 90 percent of the man made fiber produced in the U.S., which in turn represents over 75 percent of all the fiber used by the U.S. textile industry.

In 1978 the U.S. man-made fiber industry produced over 8.6 billion pounds of fiber. A number of you have asked me this week and in previous meetings to discuss sprinklers, why the fiber industry is involved in sprinkler programs and especially residential sprinklers.

It is this very subject that I would like to try to address this morning.

Let me begin by making several points. Singly, they may not answer your questions, but together I hope they will show that our Association is committed to development of sprinklers as a means of enhancing life safety.

I said that our fiber industry last year produced 8.6 billion pounds of fiber. Fiber usage is normally categorized into three groups: industrial, apparel, and home furnishings. Of this total last year the home furnishings usage of man-made fiber was 3.1 billion pounds. This is fiber used to produce the furnishings in all types of buildings, both public and private.

Fiber-containing products include carpets, drapes and curtains, furniture, mattresses, bed spreads, and a myriad of other products used in the home.

Man-made fibers are present in every home in this land. Our Association has and continues to support the objective of providing a fire safe environment in which people can live and work. We believe that one of the most effective ways of realizing this objective is a wider use of sprinkler systems designed for both public buildings and residences.

Such systems, together with early warning smoke and heat detectors and alarms, greatly enhance fire safety, provide better protection for life and property, and thus reduce the need for costly national flammability standards.

Flammability standards are not new to our industry. Products made from our fibers have been subject to flammability regulations for more than twenty-five years. In 1953, Congress found that certain items of apparel represented an unreasonable risk of serious burn injury and passed the Flammable Fabrics Act.

Some of you may remember the so-called torch sweaters and boy's chaps that were made of a very high pile fabric which could ignite readily and spread flame rapidly. These products were found to have resulted in a number of serious burn injuries and deaths.

This 1953 National Flammable Fabrics Act requires that most items of apparel meet the requirements of Commercial Standard 191, a 45 degree flammability test designed to fail fabric that ignites easily and spreads flame rapidly.

In 1967 Congress amended this act. These amendments authorized the Department of Commerce and now the Consumer Products Safety Commission to promulgate additional flammability regulations upon a finding that an unreasonable risk of burn injury or of significant property loss exists.

This authorization has been used to issue five additional standards: two for carpets and rugs, two for children's sleep wear, and one for mattresses.

I think it worth noting that the two standards for carpets and rugs were developed by the Department of Commerce's National Bureau of Standards with the support and encouragement of the carpet industry, which in turn was assisted by our fiber industries.

Although no demonstrations had been made, the carpet and fiber industries recognized that with the rapidly increasing use of carpet, a new potential for ignition and flame spread was developing and attention was being focused on this industry.

Therefore, work was directed to the development of an appropriate test method.

This program led to the pill test and ultimate promulgation of regulations which require that all carpets sold in the U.S. pass this test. The pill test provides ignition protection for carpet flooring systems - that is, carpet which will meet the pill test requirements, will resist ignition from dropped smoking material, lighted matches, electrical short circuits, and other small ignition sources.

Since adoption of this 1967 Flammable Fabrics Act, a number of other standards have been considered. Standards were seriously considered for both curtains and draperies and for blankets. Upon study, both were dropped because accident data did not demonstrate an unreasonable risk of burn injury or significant property loss.

Interestingly, during the time that a flammability test was being developed for blankets, this industry segment moved to the use of fibers and blanket constructions that would readily meet the requirements of the test under consideration and the agency found that essentially all blankets then being produced would meet the requirements of a possible standard.

Therefore, the proposal to develop a mandatory standard for blankets was abandoned.

Currently, CPSC is considering a flammability standard for upholstered furniture. Available data show that lighted cigarettes are the most common cause of upholstered furniture ignition and that 75 percent of such ignitions occur in residential locations.

The two approaches being evaluated are mandatory standard and a voluntary industry program. Both address providing upholstered furniture that will better resist ignition by lighted cigarettes.

The commission has been active even this month in considering this issue. Insiders believe that the commission will choose the voluntary approach developed by the United Furniture Action Committee, or UFAC, since the furniture industry has already shown a strong commitment to this program.

Some 70 percent or more of the dollar volume of upholstered furniture offered at the spring furniture market meet this industry criteria.

All of these flammability standards I have mentioned are federal standards, standards issued and enforced by CPSC. These standards apply to all products sold in the U.S. There is another whole layer of regulations, ones that most of you here are very familiar with, state and local regulations, building code requirements, federal regulations applying to buildings owned, operated, or funded by federal monies.

Essentially all fiber-containing home furnishings are affected by regulations of this type.

Once again, our industry has been an active participant in identifying the need for and in developing appropriate methods for flammability standards. Persons representing our Association have participated in various committees of NFPA, ASTM, and other standards-developing groups.

We have cooperated actively with federal and state agencies and with many code setting groups, as well as with other trade associations which represent the fiber and textile industries.

As an example, our Association worked closely with NBS in developing what we now know as the flooring radiant panel test. Even after development of the pill test for carpets, there remained a concern that once a fire developed in a building, carpet could become the path for spread of fire.

This concern was addressed by a very active program at NBS in which I personally participated. For over a year I served as an NBS research associate in a program sponsored by MMFPA. Incidentally, our Association continued sponsorship of a research associate program in NBS's Fire Center for over seven years.

The project I directed led to the understanding that radiant energy is a primary mechanism by which fire can spread along floor coverings. This understanding was essential in developing a test method to predict the flame spread resistance of carpeting systems.

With this knowledge, it became possible to design a test method to measure this property. The resulting test is now known as the flooring radiant panel test. It has been adopted by NFPA and other standards and regulatory groups, including ASTM and HEW, and is used with our support as a means of regulating carpet systems in corridors and exit ways of public buildings.

The pill test referred to earlier, together with this flooring radiant panel test, now addresses carpet flammability for all flooring applications. Of particular interest to this group is a statement contained in a NBS publication. The statement which I would like to quote in its entirety, is contained as the final paragraph of this publication, and I quote, "In a building completely protected by an automatic sprinkler system, the likelihood of a stage two fire developing becomes remote. The need for regulation of floor coverings under these circumstances diminishes. Therefore, the criteria suggested above could be reduced or eliminated in the case where automatic sprinkler protection is provided."

Well, so far I have talked a great deal about flammability standards. Although our association has consistently supported such regulation when a demonstrated need exists and an appropriate test method is available, we also recognize that with each flammability standard comes many tradeoffs.

These tradeoffs often include reduction in the variety of products available, less desirable aesthetics, and higher cost.

Let me illustrate this last point by using a very simple illustration of the potential cost increases that might occur if all fiber-containing home furnishing products were required to meet some stringent flammability standard.

For this illustration I have taken one room in a home and for this I selected a bedroom. I listed only the home furnishing products containing fibers. With this list I estimated the cost of these products by finding the cost of a medium priced item in a popular mail order house catalogue.

The total cost of these fiber-containing products found in just this one bedroom exceeded $600.

Over recent years many estimates have been made of the added cost to consumers that would occur if certain flammability standards were mandated. I can recall estimates for some products as low as a two-percent increase.

Using my figure of $600 to furnish one bedroom and using what I believe to be a conservative figure of five percent increase in cost if flammability standards were mandated, an additional cost of $30 would occur. Higher percentage add-ons would obviously have raised this cost. For example, a 10 percent increase would have created a $60 additional cost.

I have heard various estimates at this and other sprinkler conferences that the added cost per room of residential sprinkler systems in new construction might be as little as $100 or perhaps even $50. This simple illustration, I believe, illustrates that the big portion of the cost of sprinklers would be saved in just the possible added cost of fiber products. In addition, sprinklers are permanent, whereas most home furnishings are replaced periodically.

In my illustration I also did not include the many other products in a room which might also be subject to flammability regulations.

With our Association's continuing objective of providing a fire safe environment, we recognize that flammability standards for some fiber-containing products are necessary, but that in may cases the greater use of sprinklers and early warning systems can provide a much more cost effective alternative.

In support of this belief, our Association some five years ago formed within our Technical Committee a Subcommittee on Sprinklers and Early Warning Systems. Through this action, members of our Association have participated actively in programs of NFPA, the U.S. Fire Administration, NBS, and others. For example, Tony Shaw, Chairman of our Subcommittee, is a member of NFPA's Subcommittee on Residential Sprinklers.

Through this type of participation we do not claim to bring the technical or scientific expertise needed to develop sprinklers or sprinkler systems, but, rather, we bring a perspective of an industry now involved in flammability issues that wishes to see the most cost effective means for providing fire safety and thus providing better protection of life and property.

I mentioned Tony Shaw, who Chairs our Association's sprinkler program. Soon after Tony became involved in this program, he began planning a new home. Because of his belief in sprinklers and his desire to provide fire safety for his family and property, he decided to install a sprinkler system.

With the help of Dick Patton, he designed and installed a complete system for living areas, closets, and storage areas, a total of over 5,000 square feet.

This system was designed using the modified 13D. All copper pipe with three-quarter inch main riser, half-inch line to sprinklers. The main line is connected to a domestic water line. Installation was by a plumber. The system costs about 50 cents per square foot. Tony believes that had he used the proposed 13D standard the cost would have been reduced to about 30 cents per square foot.

In conclusion, I hope these remarks have been able to answer some of the questions you have asked me this week and earlier. Our Association does support the objective of providing a fire safe environment.

However, as an industry whose fibers have for many years been used in products subject to flammability regulation, we believe that sprinklers may well offer a much more cost effective means of achieving this objective.

As a result, we are committed to programs to support the goal of this conference, the development of low-cost residential sprinkler systems.

Thank you very much.

MR. O'NEILL: (Moderator) Thank you very much, Wells. We have time for questions and answers and I'd like to start the ball rolling by asking Chief Casper to respond relative to your comments and also Mr. Denyes on the tradeoffs for sprinklers versus the residential sprinkler systems versus the home furnishings versus safety.

I know both of you touched on that and I wonder if you would comment on that, Chief Casper.

CHIEF CASPER: I would like to know what comes first, lowering of the standards in home furnishings or the sprinkler systems. Also, if the standards are lowered in home furnishings, how about homes that don't have sprinkler systems?

Realistically, we know when standards are developed, maybe the cost can be cheap. I don't see it being very cheap, but nonetheless, I think I would rather pay $600 more for bedroom furnishings than have to pay $10,000 to put a sprinkler system in.

MR. O'NEILL: (Moderator) Wells.

Mr. DENYES: Chief, I don't think there's any suggestion, I hope, of our industry that we are supporting the lowering of standards. I think there is an effort within this country to raise the standards. But as we try to achieve that objective of providing additional fire safety, our industry is concerned with doing it in the most cost effective way.

And if sprinklers can offer more cost effective means to that goal as opposed to regulations of products, I think that's the way the consumer in this country probably would opt to go.

CHIEF CASPER: Closing comment. I see the need for the residential sprinkler system program and the changing of the standards perhaps in home furnishings to lock step. And again, I say it better be well timed and we are moving too slowly both ways.

MR. O'NEILL: (Moderator) Okay. Any questions or comments from the floor? Chief Hisley.

MR. HISLEY: Chief Casper, the $8,000 to $10,000 price on that bungalow, that puzzles me quite a bit. Was it a 13D system as it now stands put in that bungalow and what was the square footage?

Do you have an idea of breakdown of labor prices vs. material costs?

CHIEF CASPER: Well, I think to get right to the heart of it right away, immediately, it's labor cost. That's where the biggest cost factor is going to be, along with material. And I note in the sprinkler system that was shown on the screen that copper piping is used. I have been involved in many fires where there were sprinkler systems and the copper piping didn't always hold up, so the sprinkler systems were ineffective.

In fact, just recently there were two arson fires in San Francisco and the sprinkler system could not handle the fire load that it should have extinguished. If we are going into cost breakdown factor per square foot or what the materials cost, etc.

But I do know that I did talk to sprinkler installers in San Francisco before I came here and they told me that it would be $8,000 to $10,000 for the average bungalow in San Francisco.

MR. HISLEY: Sprinkler contractor?

CHIEF CASPER: Sprinkler contractor, yes.

MR. O'NEILL: (Moderator) Any other questions or comments from the floor?

MR. DENYES: Tony Shaw is sitting right over here in the tan jacket and some of you interested in home sprinklers might like to take the coffee break opportunity to chat with Tony about his system.

MR. O'NEILL: (Moderator) Sure. Let me ask you, Tony, if I might, where is your home?

MR. DENYES: Spartanburg, South Carolina, I'll answer for him.

MR. O'NEILL: (Moderator) Did you have problems, one of the questions came up yesterday, did you have problems with metering, getting the installation from the street into the house? Do you have public water, those kinds of things?

Could you comment on that?

Anybody else in the audience who have sprinkler systems in their homes? Four. We are talking now to the ultimate consumer.

MR. SHAW: Ultimate consumer. No, to answer your question, simply just the common one and a half-inch line coming in from the street which we T'd off from that to go to the separate sprinkler system and then the other line T's and goes on and supplies the other functions of the house.

Metering, no, there was no problem. I called the water department and spoke with them and they said it didn't matter. Now, we did put in a check valve to prevent any back flow. We also have an alarm system set up on it and also a test system set up where we can monitor and make sure that the alarm is working.

Does that answer your question?

MR. O'NEILL: (Moderator) Yes, it does. One more question - the total cost. Wells had mentioned the square foot and then per square foot cost. What was the total cost and square feet again?

MR. SHAW: $2,500 covering actually a little more than 5,000 square feet. That's just round figures. And it actually was about 45 cents a square foot, and this was a plumber installation. And also, we do have closets that are sprinkled and also some of the storage areas.

MR. O'NEILL: (Moderator) In the comments, Wells' comments, it was determined, or at least he said, that the standard was 13D. I assume 1976 edition modified.

MR. SHAW: Modified.

MR. O'NEILL: (Moderator) Can you just describe for me and for the audience the modifications there, too?

MR. SHAW: Well, the pipe size mainly and then using, we did use some of the sidewall sprinklers in all systems where the independent flush would be a normal kind of thing, but using the sidewall sprinklers was one of the deviations. And then mainly the pipe size.

Now, the difference in what I would do installing the same system again, I don't know that I'd run two separate completely different systems from the house supply, but I would incorporate maybe some kind of loop design where I would take water going to a bathroom and maybe run it through the bedroom and back. That way it would not grow stagnant, but would be an active kind of system as opposed to a dead system.

I think that would be quite a bit of savings by doing that design.

MR. O'NEILL: (Moderator) Okay, thank you. Are there any questions of the ultimate consumer?

A VOICE: Just what temperature heads did you use?

MR. SHAW: 165 degrees, but in storage areas where the temperature would get very hot, I went to 212.

A VOICE: What's the labor cost?

MR. O'NEILL: (Moderator) Start with South Carolina and then go to San Francisco.

MR. SHAW: I was paying $8 an hour for a helper and it was $12 an hour for the guy the helper helped.

MR. O'NEILL: (Moderator) What about the journeyman? How about San Francisco?

CHIEF CASPER: If we are looking at total cost, including contractor, we are probably hitting about $250.

MR. COLEMAN: I would just like to share with the group, as I mentioned yesterday in the panel discussion, we have a little over a thousand systems that are in Orange County right now and a gentleman by the name of Bob Hennessy, Fire Protection Analyst for the Orange County Fire Department, did a rather severe analytical study of these installations.

I must qualify that what I'm about to say is the fact that some of them are not to the 13D standard. But I have about seven in my community, including six apartment houses and seven single family dwellings, that are complete and price range on those went from $700 to $1,500 for about a 2,000 square foot house.

And these figures are, by the way, available. If the committee would like I can have Bob send them to you for inclusion in your minutes.

FIGURES VOLUNTEERED FROM
RONNY J. COLEMAN
SAN CLEMENTE, CA

Lowest Cost	$640 for a 1877 sq. ft. house
Highest Cost	$1400 for a 3500 sq. ft. house

MR. O'NEILL: (Moderator) We would love to have that and with those figures we will put them into the conference proceedings, which I think will be of help to the entire audience.

MR. JAMES SMITH: (Ex-Factory Mutual) I had a consulting job involving 32 fraternity houses at MIT in the Back Bay section of Boston. These were all retrofit, done with copper, and they were generally four story and basement mansion type houses. Each floor would be about 30 by 80 feet.

And figures out at about 12,000 square feet. These were done in accordance with pamphlet 13, not 13D. And they cost $20,000 and we are talking about having done 16 of the 32. So this is something less than a dollar a square foot.

The connections are from city mains coming in minimum four-inch size. And it would seem to me that will give you sort of the upper half.

Now, the reasons they were sprinkled were really that the systems were legislated. The fraternities had the alternative of either cutting off each floor or sprinkling or giving up these houses where the mortgages were all paid, moving into new quarters with a cost of about $750,000 to replace the living quarters that they had in the form of former mansions.

You can see that as they lived in the former mansion, their costs were very competitive with the dormitories, but they wouldn't be if they started off with a big $750,000 loan.

MR. O'NEILL: (Moderator) And it's not as much fun.

MR. SMITH: This is a special case, but the cost is indicative. The $8,000 to $10,000 in something like 5,000 square feet sounds a little on the high side.

CHIEF CASPER: Could I respond to that. What I'm talking about is a bungalow, already built, and there's no major refurnishing such as in these buildings you're telling us about. You're telling us $75,000 spent to refurbish the buildings, that's what I understood you to say.

MR. SMITH: No, what I said was on the average these buildings cost to sprinkle, completely, that means closets, $20,000.

CHIEF CASPER: Were those buildings refurbished, didn't you say there was a major contracting job going on at the site of the building?

MR. SMITH: No. This was a retrofit system, too. None of these systems, however, were concealed in the walls. They were all used by the judicious use of sidewall heads and the proper location of the feed piping.

The impact on appearance was generally considered to be minor. And that's quite an accomplishment for a house of these types which are pretty gorgeous houses built around the turn of the century in Boston by the Boston Brahmins.

CHIEF CASPER: My description was of a building already there, bungalow already there, piping hidden, sprinklers recessed, brings not only pipefitters in and plumbers in, but also brings plasterers in, too, and carpenters.

MR. JIM DUFFY: (Sprinkler Fitters Local 709, Los Angeles) I would address my question to Chief Casper and the figure he quoted on the wage per hour for people in San Francisco being $250 an hour contractor cost. Joe Mazzola may charge that. Sprinkler Local 483 in San Francisco is less than that. We don't claim to be cheap in Los Angeles, $16.30 journeyman wage plus fringe package of additional $3 an hour.

I don't think the figure of $250 an hour is accurate or reflective of any of the labor costs in any residential or commercial sprinklers. And in Los Angeles and in the State of California, even with the high wage rate, the productivity of the sprinkler fitter has been we have been able to compete with all outsiders and have done extremely well.

MR. O'NEILL: (Moderator) So what is your total contractor's cost as compared to $250?

MR. DUFFY: Per hour per man, including taxes and everything else that an employer would pay, it would be reflected in an individual's pay check, would be substantially less than $25.

CHIEF CASPER: Again we are talking about employee's wages. I'm talking about contractor's estimate by the hour. Joe Mazzola, Joe is a good friend, he would not be charging that. I'm talking about what the contractor charges. Joe Mazzola represents the pipe fitters.

MR. DUFFY: He represents Local 38.

CHIEF CASPER: We have members, people employed by our department that are members of his local.

MR. FRED MARTINELLO: (Sprinkler Fitters Local, Boston) I live in Norwood, Massachusetts. I have a nine-story house. Like you say, I am just totally sprinkled; I mean a nine-room house, totally sprinkled. Kind of nervous here.

What I did to it, this is totally sprinkled, basement, all the way up through, all the closets, I haven't got one pipe showing. All I had to do was take side walls, running down the wall. Cost was minimum. Materials, total, I spent over $400. Being a sprinkler fitter, I did the job myself, so the labor was free.

MR. O'NEILL: (Moderator) Did you connect right to your domestic?

MR. MARTINELLO: Yes, three-quarter.

MR. O'NEILL: (Moderator) You have one service coming in?

MR. MARTINELLO: Yes, I do.

MR. O'NEILL: (Moderator) Any other questions?

A VOICE: If the gentleman has one service, is he connected beyond the meter or ahead of the meter?

MR. O'NEILL: (Moderator) Beyond the meter, of course.

MR. MARTINELLO: It's not free water.

THE VOICE: What size meter will deliver the capacity?

MR. MARTINELLO: I have a gauge on the system, 50 pounds of pressure.

THE VOICE: How many gpm?

MR. MARTINELLO: I can't tell you.

THE VOICE: The report there suggests you need 25 gpm.

MR. MARTINELLO: I have pressure. In the night I have it checked off.

MR. STILLMAN: I'm another consumer. I have just completed partial sprinklering of a hundred-year-old, two and a half story balloon framed house in a New England quaint fishing type-village. Three-quarters of my costs were out of the house.

I have my figures with me. My contract cost of 18 heads was about $1,700. The problems that I found were not with the heads or the plumber or the installation. They were with the independent water company that had to go to the state Public Utilities Commission to get a special tariff for one-inch unmetered sprinklered service because all they had was four-inch in their tariffs.

Another problem is the alarm device is not discriminatory enough for normal pressure fluctuations in the system. Every time the fire department fills a 500-gallon booster tank across the street, it trips my alarm.

These are the lessons I learned. We have learned them all to change the flow trip because the lowest with the retard is one inch. Cost about 75 for the switch and 160 for the plumber to replace it. Keeping the old switch for local alarms.

I do have combination smoke detectors in living spaces; sprinklers in basement, attics and space ways. I have the plans and some of the plumber bills with me. $16 an hour labor rate incidentally; except for overtime, $20 an hour. Some of the fringe costs we didn't anticipate were the off-duty policemen for two-and-a-half days on the weekend because we were opening up the main street of the town.

MR. O'NEILL: (Moderator) Any other questions? If not, any comments from the two speakers so far? We will come back with some opportunity for questions later.

But right now you may break for coffee and be back in about 30 minutes.

MR. O'NEILL: (Moderator) I think we are pretty well ready to go and we are right on schedule. So I would like to continue our speaker's program this morning on the impact of low-cost residential sprinkler systems on various interested groups.

We have already heard from the fire service and also the fiber industry. We will now move on to the home builders. Representing the National Association of Home Builders this morning is Donald Carr, who is the Director of their Technical Services Department. Don, it's all yours.

EFFECT ON THE BUILDING INDUSTRY

Donald L. Carr

Director of Technical Services Department

National Association of Home Builders

Thank you very much. I have already learned something this morning. I didn't know that one of our arguments was the pipe was going to melt. Always pleased to learn something new.

As you know, I'm Don Carr and I'm Director of Technical Services for the National Association of Home Builders. My department is in direct contact with builders across the country virtually on a daily basis, discussing their problems and hopefully in some cases also discussing solutions to their problems.

There are nearly 120,000 members of NAHB today and nearly 40,000 of these are people whose full-time occupation is building housing of one kind or another. On behalf of those members of NAHB who are responsible for not only the construction of over 80 percent of the single family housing built in this country each year, but also the design and construction of apartment buildings, hotels, motels, mobile homes, industrial buildings, mercantile buildings, and so on and so on, different kinds of buildings. I really appreciate the opportunity to come here and participate in this conference.

First, since the coffee break we lost Chief Casper, at least from the front. There he is. I was going to compliment you on your choice of neck ties. The Chief has excellent taste.

Next, I would like to say up front that neither myself nor anyone else on the NAHB staff or any member of the NAHB questions the integrity of fire fighters and members of the fire fighting profession as they attempt to reduce fire deaths in buildings of all types.

We do contend, however, that objective analysis is important and that there's a place for emotions and there is a place for rational discussion. And at this point in time we see it as, to some extent, an attempt at least to objectively analyze what we know about this kind of technology and what we know about this kind of a problem.

In my remarks today I have attempted to keep the differences between standards development and code requirements in mind. I understand that now we are in the standards development stage and we are not arguing over a code requirement.

This, however, is not always easy for us to remember because it's relatively simple to project ahead as to where we can be in this kind of discussion within a relatively short time.

One of my functions as the NAHB staff is to convey the policy positions of the members on certain subjects to gatherings like this one. They have asked me to convey this position on residential sprinklers. Do not force residential sprinkler systems on to the American home-buying public.

Since I represent possibly the only group outside the fire protection community at this conference, and since my organization feels strongly that since the consumer, that is the American home buyer, has not yet been invited to participate in this type of a conference, it's important that we try to bring their viewpoint as well as our own, which we think at this point are quite similar.

I'm speaking to you today as your consumer. It is our builders, the members of NAHB, that many of you would have buy sprinklers and install them in new residential units. Our builders must make this decision based on their, that is the home builder's, consumers, who are the people of this country looking for safe and affordable housing.

Fifteen years ago in the early 1960s or mid-1960s, prior to a lot of activity in this country, to some extent riots in the street, to some extent the formation of HUD, to some extent the start of the recent rather intense price spiral in new housing, a large part of this country's population were able to afford the purchase of a median home, median-priced home.

Today, fewer of this country's population can afford to purchase that same median-priced home. Certainly the median-priced home is going up, has gone up, and the outlook continues to indicate that it will go up.

The cost attributable to government regulation and increased demands for safety threaten to put the price of a home out of reach of many Americans. The result of such pressure is already obvious. More and more middle- and low-income individuals are priced out of the market and forced to live in less than acceptable housing.

Does this situation, this forcing of people into less than acceptable housing because of price, save any lives? No, I don't think it does.

There is much lobbying by the manufacturers and others to have their products or ideas adopted by both government and code groups. Fewer and fewer consumers can afford the increase that these products and systems have or cause in the cost of a house. A thousand dollars more to someone in California who is already buying a $150,000 house may seem like no problem. To thousands of Americans who are currently being priced out of the market, well, it does push the dream of home ownership that much farther away. And a thousand dollars in our opinion won't necessarily buy a working sprinkler system in residences.

Our builders are looking for products that make housing safe. But, more importantly, to make it affordable and safe. Sprinklers are just one method that attempts to make houses safer, and they are a costly method. How many times have you heard the comment, "If they had had a sprinkler system in the house, the family probably would have survived?" I have heard the comment.

I contend that by itself it's perhaps a meaningless comment. But that it is just the type of comment that is picked up and turned into fuel for mandatory sprinkler legislation.

Saving lives in houses is certainly an emotional issue. The people of this country can and do respond to emotional issues. The home builders of this country contend that it would be inappropriate to delude the American people into believing that sprinkler systems in residences will save them and their families from a fiery death.

Sprinklers will certainly help. So will several other systems.

The problem is to find the most effective way to both save lives and use the already stretched financial resources of the American home buyers. Fire officials in this country have a responsibility to ask more than whether a sprinkler system would have saved lives in this situation.

We hope they will also ask questions such as: Would a sprinkler system be the best way to save lives in this situation? Would smoke detectors or fire detectors or a quicker response from the fire department or a ban against smoking in bed also have saved lives in this situation?

Sprinkler systems in residences may be part of the answer. There may very well be other answers. In any case, it would be a cruel delusion to convince people that sprinklers will make their houses completely safe.

There is concern within groups of the home building industry that there is about to be another big push to save home owners from themselves. In recent years the industry has seen the introduction of such systems as the ground fault circuit interruptor to protect home owners from electrical shocks in certain especially hazardous areas, detectors to warn people of impending danger due to smoke and fire, safety glazing to protect children and adults from the hazards of broken glass in certain instances.

The members of NAHB are not against such items. We are against arbitrary requirements or requirements based on wrong technical data. When it can be shown that products work as expected and the arguments for products or systems are based on facts, not emotion or hypotheses, NAHB has in the past, and will in the future, support their use.

The industry has seen new products become available, be offered as options, and in some cases become standard in all new homes, either due to customer demand or in some cases to regulatory fiat. The builders of this country have a very large interest in delivering new homes that are safe, affordable, and consistent with what the customer wants or is convinced that he or she wants.

The builders of this country have absolutely no interest in deliberately building houses or multi-family units that are unsafe. If the people of this country want sprinklers, there will be sprinklers. This country is based on the concept of free choice within the marketplace by the purchaser of any product or service.

However, the public is entitled to an objective analysis of the situation by those people who know most about the situation. Right now we are discussing the issue of residential sprinkler systems in conferences like this across the country. We are not yet talking to the general public about this issue. But we will be in a relatively short time.

Several possible areas have been raised that might cause builders to favorably receive residential sprinkler systems. It has been mentioned that residential sprinkler systems may provide an opportunity to get a new subdivision plan approved in an area where adequate fire facilities are not available or not currently planned.

This is more than likely a reference to the many adequate public facilities ordinances that exist around the country. These laws would prohibit the approval of a new plan of subdivision if the proposed development area does not contain the necessary essential services.

In certain outlying areas, this may very well provide a method to get certain plans approved. However, it should be kept in mind that there are a number of public facilities, other than fire services, that might hold up an approval. Sprinkler systems would only help in a very special set of circumstances.

It should also be noted that while this concept is held out as a possible way to get a problem plan approved, it is certainly not held out as a guarantee to builders that a problem plan would be approved.

I would also like to point out that as the building industry responds to the nation's energy situation, fewer and fewer small developments will be proposed in outlying areas that require long and difficult commuting by the future home buyer.

It has also been mentioned that residential sprinkler systems potentially provide builders with an opportunity to sell a high-priced option. It is true, options are nominally marked up by the builder quite a bit above direct costs. That is, there seems at first glance a pretty good profit built into options.

The truth is options are very expensive in lost time, increased coordination, supervision, and general headaches. In general, builders don't like options and don't make much profit from options. I would suggest that this particular inducement to home builders not be pushed particularly hard to encourage builders to welcome residential sprinkler systems.

Sprinkler systems have been mentioned as an opportunity to hold the lid on taxes. Will this really occur? First, it must be understood that when a county planner prepares a capital improvements plan, he or she uses standard guidelines for determining the location of fire stations.

These guidelines are based on the size of the population to be served, the ease of access on local streets, the overall density of the area, and so on.

The capital improvements budget for a jurisdiction is typically determined on a six-to-ten year cycle. The planning official and county supervisor have a great deal invested in protecting the interest and lives and properties of their constituency. If one or two new subdivisions in a county are sprinklered, this is just not going to cause a county supervisor or county government to reduce fire service and change an entire capital budget.

Remember that when Proposition 13 hit California people demanded that fire, police, and schools be maintained, and that cuts be made elsewhere. It has also been mentioned that perhaps the fire hydrant system would not have to be extended as far into a new development and this would also result in holding a lid on taxes.

Here we find a similar situation. Essentially, the argument is that public fire facilities will not be increased with the addition of new housing fitted with sprinklers. Citizens will not allow, in our opinion, their level of fire protection to be compromised.

Also, it must be understood that sprinklers help control a fire, they in no way can be the only source used to extinguish the fire.

Perhaps builders love sprinklers because of the marketing value. There are a number of sales techniques used to promote the sale of houses. Any claim that sprinklers make a house the safest house in town may be more of a gimmick than a reality.

There are many fire protective materials and devices that make a building resist a fire. Sprinklers are one of those. Also, when one makes a statement like this, the question must be asked: Safe against what?

If it is saving lives, then perhaps the claim cannot be made. A sprinklered house may protect the neighbors more from fire than the occupant of the house in which the fire has originated. An occupant may very well be dead before the sprinkler goes off and maybe a $30 smoke detector would have done more to save that particular individual's life.

Certainly there are some possible advantages to the residential sprinkler systems in certain situations. There is a possibility that automatic sprinkler systems may be used on a cost effective basis in multi-family residences where building code requirements comparable in cost to the sprinkler system can be traded off.

For example, required emergency exiting facilities can be reduced, since a longer escape time would be available. The requirements for fire walls and space separation between buildings can be decreased since the sprinkler system can control the spread of the fire. The number and size of standpipes and hose outlets can also be reduced.

We have been told that possibly some access requirements for fire fighting equipment can be reduced when sprinkler systems are reduced, such as requirements for turning radiuses and surface access routes to and adjacent to buildings.

It is difficult for us to understand how this would be possible since the sprinkler system will not necessarily extinguish the fire. The same access requirements may very well be necessary regardless of whether or not there is a sprinkler system.

Relaxation of egress requirements in single family homes is another tradeoff that has been mentioned. Perhaps the emergency egress windows in bedrooms could be eliminated because sufficient escape time would be available for use of primary exit facilities.

We urge you to keep in mind, though, according to a study conducted, I'm sure it's been often quoted here yesterday, conducted by ITT Research Institute, funded by the National Science Foundation and U. S. Fire Administration, fire incident records show that the frequency of reported fires in detector protected households is less than 10 percent less than for households without detectors.

This study concluded that, in households with detectors, most of the fires are detected early enough so that the residents can successfully extinguish the fire without assistance of fire departments and without significant property damage.

I do not disagree with the statistics of the United States Fire Administration which show that the majority of fire losses occur in residential buildings. However, these statistics do not give an accurate picture of which residential buildings account for the vast number of fire related deaths.

Is it the new houses which are built under current code requirements, such as smoke detectors, where people are dying, or do the deaths occur in houses without detectors? A recent study was conducted by the Johns Hopkins University Applied Physics Lab to assess the impact of fire protection systems on the reduction of casualities and property damage in residential fires.

This study analyzed three separate fire protection systems. They were, one, a smoke detector system; two, a smoke detector system with the capability of automatically alarming to the fire alarm center; and three, an automatic sprinkler system designated for residential use which was used in conjunction with smoke detectors.

Unfortunately, in our opinion, most proponents of sprinkler systems in single-family houses only point out the results of this study as they relate to the sprinkler systems, stating that the potential reduction in fire deaths is 92 percent and the potential reduction in property loss is 88 percent.

These people have a tendency to ignore the fact that this same study also concluded that when a smoke detector system is used the potential reduction in fire deaths is 89 percent and the potential reduction in property loss is 72 percent. In other words, the fire death reduction is practically identical with either system, yet the cost difference between a sprinkler system and a smoke detector is tremendous.

There is a very valid concern that accidental activation of the sprinkler system will result in damage to the building contents and that home owners will reject these systems based on their appearance.

While we have not conducted any surveys of our own, a recent study conducted by Rolf Jensen and Associates under contract with the U. S. Fire Administration did conduct such a survey. Fifty percent of those people interviewed indicated they would not have a sprinkler system in their residence. Ten percent feared accidental discharge. Ten percent rejected systems based on appearance. And 30 percent saw no need for such a system.

Cost was also a major factor in system acceptance according to the study. When people who would accept the system were asked about cost, 40 percent said they would pay if the cost was 20 cents a square foot or less. For a 2,000 square foot house, the system would have to cost less than $400.

Is this an achievable goal? Sixty percent would not pay for a system but would accept it at no cost. To those people who are thinking of tax incentives of some sort, the Rolf Jensen study concludes that sprinkler systems are not economically feasible in new single family residences because the cost benefit relationship between sprinklers and reduced construction cost or reduced fire losses does not justify the costs of sprinklers as we know them today.

They may be cost effective where building code alternatives or land use alternatives permit construction cost savings comparable to the cost of the sprinkler system itself. I know of no such code tradeoffs that could be made in a single family home that could equal the cost of the sprinkler system itself.

Single family homes are not the same as larger and more complex buildings. The distance to an exit is much shorter. In most cases, it is those people under the influence of alcohol unable to respond to smoke alarms, possibly the old and, in some cases, sick people and small children. Must we protect all these people from themselves or from the rare, in some cases, occurrences of fires in certain types of structures with an expensive sprinkler system, or is there a better way?

NAHB worries that the public sector is trying too hard to protect the people from themselves. People do not necessarily understand the rule or the code-making process that results in a variety of costly requirements for new homes with heavy intent of saving lives. Without question, many of these requirements do contribute to overall safety. Sometimes, however, items have questionable value.

Unfortunately the arguments and discussions which result in new code requirements or federal regulations are not made in the full view of those who must ultimately pay the bill in the form of increased housing costs.

Rather, the discussions are held and the decisions are made in technical committees and meetings, and a requirement that is questionable on its merits, but is voted as a part of a code, becomes indistinguishable from a requirement whose merits clearly indicate that the public will benefit.

We contend that the subject of whether sprinklers will benefit occupants in single-family homes may very well be in the questionable category and should not be added to the current requirements at this time.

Our position could be briefly stated by leaving you with two final questions. First, why pick on new construction when the fire hazard is in existing housing stock? And, second, why pick on the residential structure itself when possibly there are other things such as the furnishings that are highly combustible and the occupants themselves may be carelessly adding to fire risk in the structure?

Thank you very much for your time.

MR. O'NEILL: (Moderator) Any questions of Don before we go to the next?

MR. TOM ADMIRE: (Montgomery County , Maryland, Fire Prevention Division) You mentioned that the home building industry was building safety into the new homes. And I have six items here that I would like for you to respond to.

No. 1, hollow core doors. No. 2, aluminum wiring.

MR. CARR: Let me have the whole list, maybe I'll skip some.

MR. ADMIRE: No. 2 is aluminum wiring. No. 3 is shag carpet. No. 4 is open risers on stairs and No. 5 is such items as installation problems with factory-built fireplaces.

MR. CARR: You promised me six and only gave me five and I'll accept it. I may have said directly in so many words that home builders are building safety in the houses. I don't remember saying that in so many words. I certainly implied it.

We think in the home building industry, and we think that the home owning public generally across the country is able to sleep at night because they think they are living in a safe house. No one in our industry that I know of is consciously building an unsafe house.

We have to put some trust in the system. We come here today to speak before a group that is not entirely on our side because we have faith in the system. We participate in the codes and standards development process every year, every week, every month, because we have faith in the system.

The system permits hollow core doors and aluminum wiring and shag carpet and open risers and factory-built fireplaces. We have some proposed changes either in mind or submitted on a variety of subjects.

One of the ones that is in mind is some discussion of the turning of the marketplace toward factory-built fireplaces and using them in such a way that they are not intended to, like to provide a primary source of heat for the living area or major area of the house. That's not what zero clearance fireplaces were intended to do as far as I am aware.

Single-family residences have always been looked at from a fire standpoint as a single fire zone. Open risers or closed risers don't necessarily change a two-story house into a two fire zone house.

Aluminum wire, according to the new technology, construction with the right kind of connections, according to the National Electrical Code, is safe. Consumer Products Safety Commission has got some idea about the possible existing problem or even the real existing problem of the six million houses approximately that were built under the "old technology."

The system has responded to what we learned with the old technology of aluminum wiring by changing the code and prohibiting the old technology.

We urge our members from the technical services department to build in accordance with code. Our builders across the country make decisions on the basis of market and codes and cost and availability of a whole variety of things, and do not in every case pick the minimum acceptable material or piece of equipment.

They do not in every case cut the maximum amount of corners to provide the cheapest possible housing. That's an entirely separate issue, one that I have some personal feelings about whether or not we try hard enough to deliver the cheapest or the most affordable housing.

That is a separate issue. The things you mentioned are potential problems when looked at from a fire standpoint, are not in violation of the code. If hollow core doors are not acceptable to the home buying public, then they are not put in by the builder in general.

At the end of every year there are not a great deal of houses that are left on the inventory list. The home builders do not have an inventory problem like Chrysler Corporation has because of long history of the wrong decisions about which direction to go from a product standpoint.

I think your points are valid from a fire safety standpoint. I still think home builders are building essentially safe housing. And I think that - I guess I'll stop right there before I hang myself any more.

MR. O'NEILL: (Moderator) I would like you to restrict your questions to the subject of low-cost residential sprinkler systems.

MR. FRED THOMAS: (Fire Sprinkler Service) You have made a statement, "Sprinklers would help only in certain special circumstances." Now, with so few data on home sprinklers, Orange County, California, being the only place there seems to be any of any significance, where do you get these facts?

MR. CARR: Where do I get the facts that sprinklers would help in only certain circumstances?

MR. THOMAS: And also, a thousand dollars would cover the cost.

MR. CARR: In my particular remarks that sentence relates to the argument or the suggestion that residential sprinkler systems are going to be attractive to home builders because of an opportunity to get a plan approved in an outlying area that might not otherwise be approved because of, or a reduced requirement by the fire services to respond to that particular subdivision within the 6 minute time or 12 minute time or something like that.

And it was my point that there may be things other than fire protection that stand in the way of approving plans in outlying areas. I think we have to be careful when we look at the tradeoffs, and Chief Casper had some interesting comments, certainly a strong opinion on whether tradeoffs should be permitted at all.

But we have to be careful when we look at the tradeoffs that are possible, that the tradeoffs are real and not just potential or hypothetical.

The cost of a thousand dollars was pulled right out of the air. On the other hand, it was relative to some imaginary $150,000 house in California, which there are not a lot of. Most of them are more expensive than that because of a real problem out there because of land availability.

And we heard a lot of numbers earlier today about how much sprinkler systems are going to cost. I really think that it's a difficult thing to try to convince someone scraping together money for a $80,000 house that they ought to scrape together another 10 to protect themselves against the fire in that house.

If you argue it on the emotional issue, you're going to convince them every time. If you try to find the other $10,000, you can't convince them because they haven't got it, they are stretched. And the thousand dollars is a number pulled out of the air like I'm afraid a lot of numbers are that are pulled out of the air on what is the cost of a system. That's going to vary according to labor rates, availability of materials, local requirements, the size of the house.

There's just a lot of variables. So my thousand dollars was pulled out of the air, but it was a relative type of number, I thought, for the context.

MR. O'NEILL: (Moderator) Thank you, Don. Any other questions of Mr. Carr? Okay, Don, do stick around because I'm going to have, I'm sure, time at the end for more questions and answers.

Next on our program is a reaction of the impact of this whole technology from the insurance industry. Representing the insurance industry is Ralph Jackson, who currently serves as the Loss Prevention Manager for Allstate Insurance Company. He is also a member of the 13D committee.

And one thing I'd like to mention, all of the panelists today are members of one or more NFPA technical committees. And we are very grateful for that.

Ralph, it's yours.

IMPACT ON INSURANCE

Ralph J. Jackson

Manager of Loss Prevention

Allstate Insurance Company

Most of the interst shown in the insurance industry's reaction to residential sprinklers is expressed in terms of how much of a discount will be allowed. My remarks will be directed to this single concern.

The rating factors for property insurance discounts are based on the relationship of the item in question to the risk involved. Those items that tend to reduce risk call for lower rates. Those items that represent higher risk tend to have higher rates. For example, brick homes have lower fire insurance rates than frame homes. Homes with wood shingles have higher rates than those with conventional shingles.

In assessing risk, or loss potential, it is important to account for all of the factors that contribute to the claim expenses. In this case we are considering damage from fire. This includes fire damage, smoke damage, water damage, additional living expenses, the cost of the adjuster and claim support, and services.

Few people today have separate fire policies. Most have fire as one of the coverages in a homeowner policy. To understand how much sprinklers might reduce an individual's homeowner premium, it helps to look at what different coverages are included in the homeowner package: theft, windstorm damage, hail, vandalism liability, fire (and lightning) . . . F & L, damage from ice, sleet and snow, plus many other property damage perils.

The F & L coverage represents roughly 40 percent of the homeowner premium. It varies in some parts of the country where hurricanes and tornados cause large losses, but 40 percent is a good national average. The homeowner premium can be discounted for residential sprinklers only to the extend that they are effective in reducing claim expenses within the 40 percent collected for F & L protection.

For example, if sprinklers brought about 50 percent reduction in all claim expenses (remember, that includes fire damage, smoke and water damage and other claim expenses), that would indicate a 20 percent reduction in the homeowner premium (50 percent of the 40 percent collected for F & L). But wait. There is one more factor that has not been accounted for: overhead. In addition to the claim support expense mentioned earlier, there is the operating overhead to cover such things as personnel departments, payroll, general management, research and functions such as mine here today where we search for short-and long-range answers to the problems of better protection at reasonable prices. As a result, the 20 percent might end up in the neighborhood of a 15 percent discount. But please. Don't fix on any percentage or dollar figure. Let's let the tests guide us on that.

Discounts are developed in two ways, underwriting judgement and through experience rating.

Token discounts usually result from underwriting judgment. Because experience rating results from the consideration on a large body of real world experience, the discount can be as significant as the risk reduction benefit demonstrated by the factor under consideration.

Underwriting judgement can be a rather quick way to make a discount available. Experience rating takes longer, especially if the factor, like residential sprinklers, is not common enough to develop a lot of experience quickly.

What we have just gone through was presented to the NFPA Residential Sprinkler Subcommittee when the subject of discounts came up. Understandably they were not very happy about the length of time it would probably take to develop real-world experience. I wasn't very pleased with the answer either.

The following weekend it occurred to me that perhaps the current test series sponsored by the U.S. Fire Administration could be expanded to include a series designed specifically to demonstrate the ability of residential sprinklers to reduce property damage and related claim expenses. When I called Harry Shaw at USFA, he asked me to go ahead and draft test specifications and check members of the industry for their willingness to cooperate in such a test series. A check of the trade associations and a few major companies where I already had committee contacts brought an enthusiastic response.

In preparing the draft specifications, we had the services of Schirmer Engineering, Allstate's Claim Department and Tech Cor, an Allstate subsidiary dedicated to researching techniques for reducing claim costs and the training of claim adjusters.

Geoff Berlin of NFPA invited me to address the Executive Committee of the Residential Sprinkler Test Program early in August. Their reaction to the draft proposal was very positive. Some of the recommendations in the proposed draft were:

> Conduct a series of matched test burns, sprinklered and unsprinklered, to enable the determination of difference in claim expense. The tests would compare fires in kitchens, living rooms and bedrooms.
>
> Get help from the property insurance industry in designing a series of tests that would contain the information needed for experience rating.
>
> Get their participation in the collection and interpretation of the fire scene data.

The direct participation of the insurance industry in test design is considered vital to make certain that no significant test element is omitted. It should also increase the acceptability of the results.

The Executive Committee was pleased about the possibility of collecting information this year rather than waiting for ten years of real-world experience. They requested me to coordinate insurance industry participation in the expanded tests. The property insurance trade associations have agreed to participate and appointed staff to assist in the design phase. They have also recruited people from their member companies to help with both the design and test phases. By mid-October we hope to start the design meetings. Our target is to complete the design by the end of October. The matched fire tests should be completed by December 31.

Following the tests will be a period of evaluation by the trade associations, companies and the Fire Administration. Another important element will also be moving forward during that time. For any discount to be effective, there has to be a recommended standard. The approval of the revised NFPA 13D standard will clear away that hurdle.

In summary, the property insurance industry and the U.S. Fire Administration are equally interested in the potential of residential sprinklers. Both have embarked on a project to develop loss reduction information. The project is on a remarkably short schedule and is an excellent example of government and industry working together for the benefit of the public.

One last comment. When working with one of the interested groups, one of the men expressed disappointment that the discount would not be in the 50 percent plus range. He asked, "How do you expect the people to pay for their sprinklers if they only save 30 or 50 dollars a year?" Let me restate emphatically that insurance discounts are not an incentive plan to finance the purchase of hardware. Discounts are a reflection of lowered risk.

MR. O'NEILL: (Moderator) Wells Denyes, can you join us, too? We will now open up the entire speaker's panel to any questions. You can start off with Mr. Jackson since he hasn't had a chance yet to answer any questions.

Any questions for Ralph or for any of the other panelists? Yes.

MR. COLEMAN: Really not so much; I don't know if it's a rhetorical question, but when Mr. Carr made a statement when Proposition 13 was passed in California there was somehow an implied prohibition it would not mean a reduction in fire forces.

Do you know for a fact that Proposition 13 did not result in a reduction in manpower levels in the State of California for fire forces?

MR. CARR: Absolutely not. That was in the Eastern press. I'm sure it was not true. I'm sure there were reductions across the board. It was my contention if the people of California had their way and those things that were said early on when the cuts were being discussed, okay, we have to cut costs and we have to cut the overhead of our public services, but watch out for those cuts in essential services, fire, police, so on, because those are very close to the taxpayers' heart.

MR. COLEMAN: I will send you a copy of a collection of clippings after the fact where fire departments have been accused of not effectively handling certain operations when in fact they did have manpower reductions.

MR. CARR: I wouldn't doubt that at all.

CHIEF CASPER: Coming from California, we had to trim back fire fighting in every county, staffing levels, fire fighting locations. When it comes to school teachers, 1,500 school teachers were just laid off in San Francisco.

They may be able to hire half of them back, but not likely.

MR. COLEMAN: Mr. Carr also made a statement that installation of residential sprinkler systems will not result in tax reduction because of capitalization. I'd like to point out in this context that in most fire departments 90 percent of the cost of providing fire protection is in the manpower levels, not in the capital improvements.

The fact is that the reductions we are talking about in terms of fire fighting operations are not necessarily in reduced fire stations or reduced cost of buying the fire truck, but rather holding down the manpower requirements for coping with fires in those occupancies.

MR. O'NEILL: (Moderator) Anybody wish to react to that comment? If not, we will take the next question.

MR. SABHLOK: (Building Code Action) For the gentleman from the insurance company: there was a lot of discussion here about the tradeoffs and as far as I'm concerned, I think a city that's on the borderline case where its rating is class six and they make all these tradeoffs, and they get their reevaluation, it turns out now the city has moved to eight or worse.

And in that circumstance whatever benefit, if the insurance service gives any benefit, would be minuscule compared to the rates that would go out way above because the city has now lost the class rating because they were sold a bundle of goods saying let's make the tradeoff because we won't need personnel and water supply.

We know the case to be otherwise. Incidentally, I would urge Chief Casper to tell the audience how many people he has on his staff so you get a feel for how short he is on manpower and how many vacancies he has to fill.

I think you may not read that in the press in this area.

MR. O'NEILL: (Moderator) The first part of that question was aimed at Ralph.

MR. JACKSON: I would like to talk to you one-on-one later. But in answer to your question, let me say that we can't tell you what the dollars and cents of it are going to be, not even in rough terms. All of these insurance people who so enthusiastically said we would love to join in the search for information, please don't interpret that to mean they became true believers as soon as I got them on the telephone. They are coming in on a search for information.

One of the things that impressed them most was the incredible opportunity for private business and government to work together to get the information up front as opposed to afterward. That is a real plus and it doesn't really very often happen that way. We are very pleased to be a part of it.

There are some people within our industry who ask some questions. There were references to it earlier about leakage, about accidental triggering. And the question was raised, "How are we going to cover that"?

Under the more comprehensive forms of homeowners policies, one of those many perils I lumped under many other property perils is leakage. Under your homeowners policy as opposed to a straight residential fire policy you're covered if your pipes start leaking.

Now, that would cover a residential sprinkler installation under the policies as they are now written. And the question came up right away from one of our product development people, "Does that mean we will have to develop a residential sprinkler exclusion?", and then give them a buy-back, which is an insurance term where you buy the protection back as an option.

In a day and age when we have millions of policies just in our company alone, we are not looking for ways to complicate the record-keeping process; we want to keep it as simple as possible, so the idea of an exclusion and buy-back is as good as a broken toe to a sprinter.

We don't want that. We are going to be looking at all of these factors; I can't tell you what the relative impact is going to be on town class. Dick Hughey, who is much more experienced than I because of ISO's activities, may want to respond to that separately.

CHIEF CASPER: This comment is usually made at our chiefs' meetings and press conferences on television and radio. The San Francisco Fire Department 12 years ago had a daily staffing of 500. Four years ago when I became chief, not quite four years ago, three and a half years ago when I became chief, the daily staffing was 409. I had to reduce that daily staffing to 343. Proposition 13 has now reduced it to 329.

And next year the city faces a deficit of $100 million, which means that there will be no more bail-out funds coming and we will further have to reduce. I haven't even calculated what the daily staffing will be, but we will have to take 20 percent of what we have now, which means the elimination of about 12 fire fighting companies, cut back too on fire prevention, cut back every where possible and do away with 158 fire fighters' positions, hopefully mostly through attrition, but there will be some layoffs unless a way is found to upset it. But there won't be any more bail-out money.

MR. O'NEILL: (Moderator) Any other comments from the panelists?

MR. DENYES: I want to comment on what I believe is perhaps the unsaid goal of this entire program, and it's simply not one to get sprinklers in place. I think the goal, as I understand it, is to try to address the overall problem of reducing fire loss, injury, deaths, property damage.

In Mr. Carr's comments, he made the statement that the building industry is not aware of any tradeoffs that would be available to offset the cost. Throughout this morning I think I have heard many potential tradeoffs.

I tried to address the one that relates to home furnishing products. Mr. Jackson addressed the issue as it may relate to tradeoffs in insurance. I would like to suggest that one of the challenges of this group is to carefully consider the tradeoffs in all areas that might become available.

And I want to reiterate the phrase I used in my comments, I think we are all looking for the most cost effective means of enhancing life safety.

MR. O'NEILL: (Moderator) Any questions from the floor? Comments? Yes, Harry, Harry Shaw.

MR. SHAW: In January, Don Carr will get me in front of 80,000 home builders, so I'll be real kind to him. I'd like the audience to know he has invited the Fire Administration and NFPA to come to Las Vegas. We will probably lose our shirt, but we will have a chance to present to the home builders the position of the Fire Administration and the NFPA on home sprinklers.

And, of course, we are going to try to take care of that opportunity and do what we can. So be kind to me, but I do have one question.

Don, when you quoted the savings between detectors and suppression systems, the difference seemed very minor, but you left out the footnote. The footnote is that the numbers you used assumed proper occupant reaction and an effective system. In addition, the numbers shown for detector systems are more occupant dependent than the numbers shown for either remote alarm systems or suppression systems.

Detectors must be properly placed, installed, maintained and tested and the occupant must have an escape plan.

All of these things are much more so with detectors than they are with suppression systems and, therefore, the numbers that we used were upper limit numbers. We believe that the detector upper limit number may come down 40, 60 or 70 percent, but the suppression upper limit number will stay very close to where it is.

MR. O'NEILL: (Moderator) Any comment?

MR. CARR: I agree that I skipped the footnote. We are going to spend a lot of time in the next couple of years skipping footnotes or pulling numbers out of context or quoting the numbers that we choose to quote and ignoring those numbers which we choose to ignore. And we look forward to that and we are going to try to keep you honest as well as we hope you're going to keep us honest.

As I said, we have faith that the system will ultimately deliver us the right answer. I think that, just to pull on one of your facts, that means that in actual practice the smoke detector system would only reduce lives by 20 percent instead of 88 percent. That is a number that I'd ask to see verified somewhat: it's a hypothesis, as are some of the other numbers.

And it's part of the challenge to the technical community to try to sort out the hypotheses from the real answers and those answers that can be backed up, and we are going to be searching for the truth and we hope that you all will join with us in searching for the truth and at some point down the line we look forward to making a decision based on facts.

That's all I have to say on that right now.

MR. O'NEILL: (Moderator) Any other questions or comments? Yes, come to the microphone, please, Bill.

MR. WILLIAM H. EVERARD: (Fire Protection Engineer with the City of Alexandria, Virginia, Fire Department) I would like to make a plea to this group directly related to not only sprinklers, but all of the bits and pieces of the life safety protection systems.

We heard an awful lot about what people are doing, where we are going, and everybody is happy with the cooperation. In relation to Chief Casper's comment, in the meantime, in the interim period, would you please encourage each and every one of your organizations, the companies you work for, the people you yourselves work with, to get with your local enforcement people, who are the bad guys in the cost of buildings, and let's work together with what we already have to try to keep this thing in perspective.

We may find there are some usable guidelines in the development of what we work for. Thank you.

MR. O'NEILL: (Moderator) Thank you, Bill. Any other questions?

MR. ADMIRE: This is a statement rather than question. For those who appeared to be reluctant to accept the concept of residential sprinkler systems, I would like to leave this last thought.

I do not believe there's an individual in this room who is not attempting to pass on to the generations yet to come a better legacy and a better place to live than the ones that we have inherited from those that have gone before us.

Even though residential sprinkler systems may not be the total answer, I believe it is definitely a step in the right direction.

MR. O'NEILL: (Moderator) Anybody on the panel want to comment on that?

MR. CARR: Builders join with that. We have children and wives and people that we care about. We are not entirely interested in profit, but it certainly is a motivating factor. As I said before and as I really mean, we do not question the integrity of those people on other sides from us.

We are looking for the right answer and we look forward to the search and we agree with those people who think it ought to go faster, but there's a large amount at stake and it's got to be done right, too, and that is the system as well as the caring and concern that has been expressed here and in other meetings like this.

MR. O'NEILL: (Moderator) As a way of introduction, Phil Schaenman, who is one of the Assistant Administrators at the Fire Administration, and, who ultimately is responsible for this program. Harry Shaw works for Phil. Phil, with that introduction, yes. Glad to have you with us today, Phil.

MR. SCHAENMAN: I had a comment, really in the way of a challenging question. I think Chief Casper at the beginning of his talk mentioned that the United States has the highest fire death rate in the world, about tied with Canada's. Just a couple of points of information on that.

The difference between us and the rest of the countries is almost entirely in the residential area. Part of it is in vehicle fire safety, but mostly it's the difference in residential fire safety.

When you look at the countries we are comparing ourselves with, it ranges from Japan where the homes are largely paper and wood and much more flammable than the typical American home, although with much less furnishings, to the other extremes in western Europe, where they are typically less flammable where structure is concerned, to Scandanavia, where they are more comparable to ours.

So you have a whole spectrum from more to really less flammable homes, all doing a better job in life safety than we are in our homes. No one is sure for the reasons for the difference. One of the leading hypotheses is that it is the behavior of the American public.

We tend to be a careless people. We tend to literally burn up things, be wasteful, not be very safety conscious.

The question is how do we overcome that. We can do that partly by education, Learn Not to Burn-type programs. But we may need devices to counter the behavior. In fact, in fire, it's one of the only areas where there is a device that can help solve the problem if it's affordable. It's not like crime where there really is no gimmick, there is no piece of hardware that can solve the problem. There is in fire.

I think the question is: How affordable can we make it?

So just a little bit more food for thought.

MR. O'NEILL: (Moderator) Thank you, Phil. Any comment or reaction to Phil's?

MR. BILL NICKEY: (NAHB) Do any of these foreign countries have any experience with residential sprinkler systems?

MR. SCHAENMAN: Not that I really know of. Nothing extensive.

MR. O'NEILL: (Moderator) Does anyone in the audience know the answer to that question? Are there any foreign countries who have gotten into residential sprinkler systems yet? Bob Gray says no, not that we know of.

Any other questions or comments of the panelists? If not, I would like to make an announcement or two - one of them being Chief Gerard, who will be the Panel Moderator this afternoon, would like to meet with his panel.

Thank you for your attentiveness. We will see you after lunch.

SESSION IV - TOMMORROW

John A. Love

President

Factory Mutual Research Corporation

Moderator

Yesterday morning Jack Rhodes talked about the tests that were run at Factory Mutual in Norwood, and one of the things he said was that they pointed out the importance of sensing and actuation to the success of the residential sprinkler program.

So with that in mind, the USFA commissioned Battelle to study sensing and actuation. And this afternoon we are going to hear from Dave Doerschuk, a Principal Reasearch Engineer from Battelle, who has been working on this project for USFA. I think you're going to find what Dave has to say quite interesting.

He has some novel ideas and I think that even though we have developed something that appears to be sensitive enough, Dave has quite a little bit to add to that. David.

THE FUTURE OF SENSING AND ACTUATION

David Doerschuk

Principal Research Engineer

Battelle Columbus Laboratories

Previous research at Battelle has shown that it is possible to control residential fires with relatively low water discharge rates. This indicates that an effective residential fire sprinkling system can be built using reduced size and, therefore, lower cost components. As cost is an obstacle that must be overcome for automatic fire protection systems to gain widespread residential use, Battelle is investigating novel techniques that simplify and miniaturize the system.

The overall performance of an automatic fire protection system can be measured in terms of response time to various type fires, water supply characteristics, susceptibility to false activation, and cost. System and components presently available perform satisfactorially in some of these areas, but are unsatisfactory in others. Present smoke detector technology can provide excellent response time to most fires, but in many cases is susceptible to false activation; many existing sprinklers apply far too much water volume required for extinguishment of residential fires and continue to sprinkle after the fire is dead, causing water damage that often exceeds fire damage; complex systems are available that include smoke detectors, heat detectors, alarms to occupants and fire departments, sprinklers, and microprocessors; however, they are expensive beyond a typical homeowners budget.

The automatic fire protection system, depending on configuration, has numerous components including fire sensors, electrical power supplies, alarms, wiring, sprinklers, sprinkler actuators, piping, and water supply. The two most important functions of an automatic fire protection system are fire detection and fire containment. Detection is required to initiate containment and alarm occupants; containment is required to allow occupant escape and reduce property damage. On this basis, the Battelle efforts are directed toward the system components that detect and protect, namely sensors and actuators. Battelle believes that application of new technologies to sensors and actuators is the critical requirement for innovation. Significant advances have been made with all the system components; however, sensors and actuators are the basic components around which the entire system is designed; therefore, innovation in these areas will affect all components and allow design improvements to permeate the entire system.

Battelle is presently conducting a program for the United State Fire Administration to investigate and develop certain technologies to improve sensing and actuation. We have gathered information pertaining to a wide variety of potentially feasible methods. Comparison studies show some of these methods have merit and some do not. Of the better concepts we are currently developing technical areas in which we possess demonstrated capabilities. At the end of this program in December we will invite the industry to a briefing of our results and a final report will be available through the United States Fire Administration.

Let me summarize the results of our work during the past four months and describe our development plans for the remainder of this year. First I will identify all the concepts for sensors and actuators that we found and our criteria for selecting the better concepts to build working models. Then I will describe the models and equipment we use to test them. Finally I will summarize the results of our first tests and discuss the component costs of sensors and actuators.

The FIRE SENSING CONCEPTS that we explored include:

Frangible Glass Bulb
Fusible Link
Nitinol
Thermal Resistor
Semiconductor Temperature Sensor
Semiconductor Gas Sensor
Fusible Electric Insulation
Gas Ionization
Photoelectric
Infrared
Ultraviolet
Microwave
Pneumatic/Fusible
Pneumatic/Bimetallic
Pyroelectric
Quartz Crystal Thermometer
Rate Compensation Detector
Thermocouple
Ultrasonic
Bellows
Aerodynamic Separation

The eight SPRINKLER ACTUATOR CONCEPTS to be evaluated were:

Frangible Glass Bulb
Fusible Link
Bimetallic
Nitinol
Powered Nitinol
Pyrotechnic
Solenoid Valve
Bellows

Battelle compared the sensor concepts using the following CRITERIA:

Response Time
False Alarm Rate
Cost
On-Off Capability
Extra Power or Equipment Requirements

To evaluate the actuator concepts we used another set of CRITERIA:

Reliability
Cost
On-Off Capability
Extra Power of Equipment Requirements

Using the criteria we SELECTED four sensors for hardware developments; these include:

Fusible Link
Nitinol
Thermal Resistor
Semiconductor Temperature Sensor

The Fusible Link and Nitinol are both sensors and actuators. They also perform well according to the actuator criteria. The other actuator concepts SELECTED for hardware development were:

Pyrotechnic
Powered Nitinol

At this time many of you are wondering what is Nitinol? Nitinol is an abbreviation of Nickel Titanium Naval Ordinance Laboratory. About fifteen years ago, the U.S. Navy discovered a nickel-titanium alloy that will "remember" its original annealed shape when heated through a temperature transformation range. For example, one Nitinol wire can be stretched 8 percent in length at room temperature. It will remain in its stretched condition until it is heated from 120 to 135 degrees F. As it is heated, it will exert itself up to 80,000 psi trying to recover or "remember" its original length. Nitinol can be heated directly by a fire, then it will exert a burst of useful work as it passes through a preset temperature range. As such, Nitinol is both a sensor and actuator. Nitinol can also be heated by passing an electric current through it. The powered Nitinol actuator functions when it receives an appropriate electric signal from a remote fire sensor.

Now let me describe sensor and actuator working models that we are building and testing. All the models are built to verify performance only, and are therefore crude prototypes. Each model can eventually be refined for low-cost, high-volume manufacture and aesthetic appeal.

It is only logical that the FUSIBLE LINK SPRINKLER would perform well according to our criteria as it is the most prevalant sensor/actuator in existence today. To improve this device we use a link that is more sensitive to all forms of heat transfer than conventional fusible links. We found a link normally used to actuate an audible freon-powered alarm and adapted it to a conventional industrial sprinkler. The new link is on the right sprinkler; it consists of two stainless steel sheets bonded by a eutectic alloy. This change radically improves sprinkler response time as I will show you in a moment.

The NITINOL SENSOR ACTUATOR was built using a commercial palm-operated valve. The valve is turned on by a pivoting arm which is powered by a small piece of Nitinol wire that contracts upon heating. When the Nitinol cools, a spring can be used to stretch the Nitinol again, thereby closing the valve and allowing the device to turn off and be reusable.

THERMAL RESISTORS are used in electrical circuits to accurately detect temperature and are inexpensive. Battelle is experimenting with commercially available electronic components that sense threshold temperature or rate-of-rise and trigger an electric actuator if preset levels are exceeded. The actuator remains on for a predetermined time after the threshold or rate-of-rise falls below the preset values. Semiconductor temperature sensors are available in many different forms. Battelle is experimenting with a transistor-based circuit that performs the same on-off functions as the thermal resistor circuit. We selected a transistor that changes current levels very linearly with temperature. Shown is the transistor sensor and the threshold/rate-of-rise triggering circuit. We built this device using components that cost about seven dollars.

Both the thermal resistor and transistor-based circuits can be used to control the pyrotechnic and powered Nitinol actuators. The powered Nitinol device is being built now. We use a small piece of Nitinol to open and close the pilot of a pilot-operated valve.

Pyrotechnic actuators are available in Germany to turn on sprinklers. We designed an actuator with TWO PYROTECHNIC DEVICES. One turns the sprinkler on; the other turns the sprinkler off upon command of an electrical signal. Pyrotechnics are usable only once; they consist of a sealed expandable housing containing a small amount of explosive and electrical resistance wire that fires the device when current is applied and expands the housing. The PYROTECHNIC ACTUATORS we use in our device are one-eighth inch in diameter and less than three-quarters of an inch long. Upon firing, they extend to over an inch-long and create a twenty-pound force.

As we selected our concepts for development it became apparent that all the selected techniques sense fire thermally. For this reason we assembled test equipment that mainly measures thermal performance. We made a plunge tester to compare response time. We are also testing our devices in a machine that delivers a programmable cycle of temperature changes. We control a hot air blower to deliver an airstream of consistent speed and temperature, then plunge a test model into the stream and record the time required to activate. On this machine we tested several commercial sprinklers; most of these required forty-to-sixty seconds to activate. The fastest reacting commercial sprinkler we could find required slightly over six seconds. Our modified fusible link required three seconds and the Nitinol sensor actuator required four seconds. Needless to say, these results were very encouraging.

Another lab test we are performing is flow comparison of various actuators. A heater is used to activate the sprinkler then water flow is gaged by measuring time to fill a given volume. In this test our Nitinol actuator delivers approximately one-sixth the flow of tested industrial sprinklers. Our previous research indicated that residential sprinklers should flow about two-fifths the level of industrial sprinklers, so Battelle's near term development efforts will include the improvement of actuator valve characteristics to optimize flow.

All the concepts we are developing can be manufactured at low cost. The creative use of certain plastics will reduce cost and add aesthetic appeal. The pieces of Nitinol we are using can be manufactured for less than a dollar. The pyrotechnic devices we are using can be obtained in quantity for less than four dollars each. The most expensive sensor actuator combination we are looking at is the transistor sensor and the pyrotechnic actuator. Total parts cost of this system is in the range of twenty dollars; the other concepts should be less expensive. We consider this array of models to be a good starting point for developing more useful automatic residential sprinkling systems. Hopefully, enterprising manufacturers will take our models and refine the best into systems that experience widespread usage.

MR. LOVE: (Moderator) I think there's some time left if anybody would like to ask David some questions. Any questions?

MR. PEPI: It's my understanding that Nitinol is not a commercially available product yet and it was running around $150 to $200 a pound, or in that kind of ball park. Is that still the case? Are you extrapolating the weight of a very small part? What kind of cost per pound actually are you working with?

MR. DOERSCHUK: Nitinol is not being manufactured now. It's available; we have got some at Battelle. I guess there is some in limited supplies at manufacturers that were manufacturing it three or four years ago.

MR. PEPI: It is no longer in production?

MR. DOERSCHUK: No, it's no longer in production. Nitinol is an invention that sat around waiting for an application and hasn't found one yet. The actual cost, though, that I gave you on the dollar, less than a dollar for these pieces of Nitinol, is based on what the manufacturing cost was when it was being manufactured.

And the beauty of Nitinol is that a very small piece of it can exert a very large force, so you don't have to use very much Nitinol to get a lot of work out of it.

MR. PEPI: The other question I have is, in the modified sprinkler in which you were able to obtain a three- or four-second response time relative to the longer response times, did you run a hydrostatic test on your sprinkler to be sure that it can withstand a 700 psi spurt point?

MR. DOERSCHUK: No. We designed the linkage that holds the falcon link to stand a 100 psi, which is more than the house water pressure we were using to test the system. The linkage would have to be redesigned to get a 700 psi hydrostatic test.

We only designed the link to withstand the pressure it was going to be used at without leaking. It was not designed for a hydrostatic test.

MR. PEPI: I would suggest to you that there are home water supply pressures well in excess of 100 psi and that you should take into account the practical considerations of water hammer in the home which, you know, can exceed pressures again well in excess of 100 psi.

MR. DOERSCHUK: Right, I agree with you. All we are trying to show with this test - we are not trying to design a final piece of hardware - we are just trying to show that the sensitivity of the fusible link can be significantly increased.

MR. JOHN KAUSSNER: (CDA) Within the last couple of weeks I became aware of a memory metal; I don't know if this is the same we are talking about.

MR. DOERSCHUK: Probably is.

MR. KAUSSNER: This is a copper-based alloy and made by Raychem.

MR. DOERSCHUK: No, there's no copper in Nitinol.

MR. KAUSSNER: I know it, but this is a memory copper alloy similar to the titanium alloy you're talking about.

MR. DOERSCHUK: A modification?

MR. KAUSSNER: Yes. I think there's something currently available. I have seen samples of half-inch couplings that are used for joining two copper tubes together and when you put a torch to it, it shrinks. It makes the joint in place.

So I just mentioned the company's name; I don't know the composition of the alloy.

MR. DOERSCHUK: What was the company?

MR. KAUSSNER: Raychem in California. A fast-paced technical company; you might want to check them out on it.

MR. LOVE: (Moderator) Anything else? Thank you, Dave. I think we want to keep in mind that David's project is research. He's only exploring ideas and it would be his hope that manufacturers and industry would take those ideas and make them workable.

On Wednesday morning we heard from Harry Shaw about the objectives of the U. S. Fire Administration to reduce loss by fire by 50 percent within a generation. And at that time he outlined four phases in the development and implementation of a residential sprinkler system to accomplish this objective.

Also, on Wednesday morning and here just now, we have heard various progress reports on the status of the technological development of that residential sprinkler system.

We have also heard progress reports on the status of the development of standards for that residential sprinkler system. And you today explored the impact that the residential sprinkler system might have on the fire services, the building industry, and on insurance.

During all these discussions there have been various projections about the time when the residential sprinkler system would be commercially available. There have been some ideas on how it could be made commercially available, through legislation, through voluntary sale, or however.

Now we come to a session wherein we would like to take an open look at the possible obstacles to the implementation of this residential sprinkler system, and where I hope, on the positive side, we will take a look at the suggestions for overcoming those obstacles, and for some feedback to all of the groups working on this project as to how to proceed from here.

And to do this we have set up a panel discussion and the chairman of this panel is going to be John C. Gerard, Chief Engineer and General Manager of the Los Angeles Fire Department. John, I turn it over to you.

PANEL DISCUSSION - WHERE DO WE GO FROM HERE?

Chief John C. Gerard

Chief Engineer and General Manager

Los Angeles Fire Department

Panel Chairman

PANELISTS:

Paul R. DeCicco, Professor of Civil Engineering and Director of the Center for Environmental Studies, Polytechnic Institute of New York

Rolf H. Jensen, President
Rolf Jensen & Associates, Inc.

Edward J. Reilly, President
National Automnatic Sprinkler and Fire Control Association

Philip C. Favro, State Fire Marshal
State of California

Thank you, Jack. Well, it's nice that we got on before all of the airplanes left, anyway. The panel that we are going to have this afternoon, the final panel for this conference, consists of four other people. First we have Paul DeCicco. Paul is Professor of Civil Engineering and Director of the Center for Urban Environmental Studies at Polytechnic Institute of New York.

He is a registered engineer, a member of NFPA, and the Society of Fire Protection Engineers. He has been involved in several full-scale fire tests as principal investigator in New York City, the 30 Church Street fires, and the two separate fire tests in frame dwellings. He's a consultant for the New York City Fire Department and New York City Building Department dealing particularly with Local Law 5, which I think every time New York City needs to make some news they either repeal or reenact Local Law 5.

He's the Chairman of the Committee on Performance of Structures Exposed to Fires of the American Society of Civil Engineers and currently is involved in installation of fire protection measures in frame buildings in New York City and smoke control in atrium buildings.

Paul, it's going to be a pleasure hearing from you.

Next we have Rolf Jensen, who has been introduced so many times everybody figures he is related to us. Rolf, I'm not going to go over your bio one more time. You may make your airplane that way.

The next member of the panel is Mr. Ed Reilly. He's the President of the National Automatic Sprinkler and Fire Control Association. He's been doing that for 24 years. He has been Director of Codes and Standards for 20 years.

Primarily that's been his responsibility. Secretary of Engineering and Standards Committee for 22 years and he represents the sprinkler industry on different standards involving the manufacture and installation of sprinklers at UL, FM, NFPA, ASTM and so forth.

I think Ed's credentials are long, very heavy, and impressive.

Finally, we have Phil Favro, the State Fire Marshal from the State of California. Phil is a former officer of the San Francisco Fire Department and has been very active and is an interesting Fire Marshal, I believe, primarily because he is innovative and creative and different and the only State Fire Marshal in the United States with a beard.

I'm not going to engage in a lot of initial comments myself. What I would like to do is introduce and have each of the panelists make his presentation to you and then I'd kind of like to sum up. I have been sitting in the back of the room for the past two days making notes on what different people have said and some of their positions, opinions and so forth, and have tried to see if I could draw it altogether.

And so I'm going to do the same thing while these four gentlemen are expounding their wisdom for you, and then we will wrap it up, answer any questions you have, and finally turn it over to Charlie Morgan for the blessing or whatever it is we are going to get just before we walk out the door.

First we would like to hear from Paul DeCicco.

I suppose each of us considers the question of where do we go from here from a perspective and bias which reflects his own particular experience, and therefore, the answers he submits are given in context of situations with which he is most familiar.

The descriptions which fit the context in which my answers are set, are:

Large, old, urban centers of the country

Many poor and rundown subcommunities

Residential neighborhoods served by a worn infrastructure, RE: streets, sanitation services, building services

Most dwelling units over fifty years old

High fire loading and other risks relating to building deterioration

Superior Fire Department

High incidence of fires - in New York City - all fires - 50,000, structural, residential, 35,000 number of "set" fires - growing 20 percent - 25 percent - 30 percent, depending upon neighborhood.

Given this setting - -

For the future I see some urgent needs, and given the high costs of fire involved, I see much too feeble movement towards meeting these needs, which include:

A new philosophical approach which advocates or at least accepts less than complete protection as soon as possible. For we should be looking to maximize reductions of life and property loss - not to perfect systems for which "state-of-art," time for accomplishment, and costs, all work against the real and practicable goal of achieving the greatest enhancement of residential fire protection in the least possible time.

A renewed, or at least updated, public education policy and program which will convince homeowners, landlords, tenants, elected officials and other decision makers of both the need and benefits of installing positive protection devices and systems in every residential building.

Improved technologies which bring safer and more economical materials and methods for installation of sprinkler systems. And related to this, sprinkler contractors have to clean up their acts with regard to overall goals, the quality of their performance, and specifically their willingness to become more involved in the residential sprinkler system installation market.

Having said that about needs - a few words about expectations: the bad news first - -

The ever increasing number of codes and code-writers, the natural conservativeness of regulatory agencies, and the competitive interplay among vested interests in the fire community will continue to constrain new philosophies regarding implementation of partial measures, even when such approaches offer the quickest return in enhanced life safety and property protection.

Public education in fire prevention and fire safety will continue to be sporadic and somewhat random, with best efforts often directed to convenient places rather than high-priority areas, and generally not at the scale required to really make a difference. To the extent that there is an educational job left undone regarding residential sprinklers, this will hurt.

Since the fire community itself is not geared or motivated towards "break-through" technology, there will be none. Sprinkler contractors, like all people in business, will continue to go to the large, lucrative jobs. The iron pipe makers and distributors will continue to work against copper tubing, and other materials, even if in certain instances they prove to be more cost effective.

On the bright side - -

There are possibilities that sprinkler systems will go together faster, because of better means for connection which are more economical and have greater realiability.

Sprinkler systems will become more acceptable as: their response times are better articulated, the quality of installation regarding esthetics is improved and some favorable and convincing experience regarding their use in dwellings is accumulated.

The insurance community will, "with some encouragement," recognize, and accomodate in rate structures, sprinkler installation in a more realistic way than they have in the past.

Design professionals, engineers, architects, and interior designers will become more interested and involved in fire safety and will move to sprinklers as the sure way to reduce losses.

The fire services will show greater willingness to take on fire prevention inspection and enforcement activities. Sprinklers have always been their favorite and better products will give them more to work with in both new and existing residential buildings.

The nation's housing stock is being kept in service for longer periods. As it deteriorates further, and as fire services are curtailed, or at least not expanded as required in the inner cities, as there is little reason to expect significant reduction in the combustibility of construction materials or contents in residential buildings, and finally as styles of living, particularly in the poorer neighborhoods change very slowly . . . .

The installation of low-cost residential sprinkler systems may prove to be the only game in town for the next decade.

MR. GERARD: I'm not sure that I would agree with your analysis of the New York Fire Department. We argue that quite often when we get together who is the best. We don't do it in public because we know we are both the best.

Our next speaker, once again, is Rolf Jensen. And you talk about a difficult speaking job. How would you like to speak to the same group of people four times and pick four different subjects when the subject is always the same thing and figure out something different to say.

But if there's anybody who can do that, it's Rolf.

MR. JENSEN: I don't know whether to say thank you or not for that introduction. But thank you, Jack.

With regard to the revised edition of NFPA 13D, we have yet, as I have said before, a few things to finish. We have some validating data that relates to this revision that has to be completed. That data could come in and validate this precisely, in which case it hopefully will proceed through the NFPA standards-making process in essentially the format that some of you now have copies of, or based on changes that derive from that data, there could be changes in the standard.

If the data comes in and says the density of 0.08, 0.06 is not the right density, we need something different. The game plan right now will be that will be introduced as a public comment with support and the change made in what is known as the documentation part of the NFPA standards-making cycle.

The second thing that has to happen is we have to get the product test standard, and you have heard that, but that is yet to come. I personally think that there are some very important matters that have yet to be resolved. I believe that I see at the moment a bit of difference existing between those who will make the product and those who will test the product.

What I see at the moment is some rigidity probably based on an experience with commercial sprinklers that may put a bit of overkill in the testing procedure and limit the freedom of development of new products.

But that I think is going to have to be resolved and very likely will be. I don't know with how much difficulty or lack of difficulty, but it will have to be resolved.

And finally, we will, having resolved that, have to have the actual development of the commercial product recognized by approval laboratories.

The game plan is for those three to come together, we hope, I can almost say we pray, by November of 1980. That's a very critical path problem. The game plan time cycle is that (and I'm approximating the dates - in theory I should know them by heart, but I confess that I don't memorize them) the report of the Sprinkler Committee must be finalized by about the first of November, it goes to the printer about the first of December, and it comes out to the public about the beginning of February.

So for those of you who aren't lucky enough to get a copy of the standard today, you can either write to the NFPA and ask for a copy, or you can wait until February and get a copy in what will be known as the Technical Committee Reports.

Once those Technical Committee Reports come out, if these two days are any evidence, you are all quite capable of commentary, certainly of thinking. Read them and if you have recommendations, suggestions, opinions, there is a prescribed procedure by which you can register your proposals for changes with substantiation in the NFPA process.

That then will be reviewed by the Sprinkler Committee in a meeting that will probably take place along about June of next year, and a modified report possibly, modified to the extent that data or commentary dictates, will be published. And that ultimately will go to the floor of the NFPA Annual Meeting in November of 1980 for final acceptance.

If we are delayed in getting the data or if something comes up that says we didn't fairly consider the concerns of a particular affected group, we could get knocked off that time path. But there is provision for delay in the cycle, and the process, I think it's fair to say, is quite orderly.

Now, then what? Well, at that point, as I see it, we then have a modified draft which then we hand to the public, that's all of you, and a lot more. And the extent to which it is going to be utilized, to which it's going to be, pardon the expression, sold to the public, is going to depend upon people like the gentleman who stood at the microphone in commentary after one of my talks, I don't remember whether it was yesterday or last night or three weeks ago now, and said, "Look, guys, if you can describe it and make it cost effective, I can sell it." We are going to need people like that.

I am personally of the opinion that I hope it will be a sale and not rammed down somebody's throat. And I recognize that some of both will occur depending on circumstance and area.

I think we need some very serious additional studies in this sale. I think they come somewhat from my understanding, at least, of some of Ronny Coleman's comments. One of the very important vehicles that's going to help sell this thing is an understanding of the total impact on the community.

And I would like you to think of the word "community" in terms of its not just being a city or town, but any sociological or social group. And we have a lot of different communities to convince, each of which has a progressively more complex total fire protection picture and a progressively more complex total cost benefit analysis that ought to be addressed.

I believe there ought to be some additional studies to show the cost benefit impact on the home, the cost benefit impact on the apartment, the cost benefit impact on the city or the town or the farm or the high-rise hotel or the state. And I guess we thought we did the one on the nation.

But that one is too general to help a guy like Ronny Coleman go to his city council and say on a cost benefit basis in this community, I can save you guys six million bucks over the next ten years in the cost of, total cost of, fire protection for this community. I think those pilot studies will have to be done by somebody.

And that will be important to selling it.

The Sprinkler Committee is going to be working on polishing the details. I have no illusions that once we get through the LA and the Charlotte test series on dwellings and mobile homes that we will necessarily have all the answers. Probability is, like most research, we will have more questions when we get done than we have right now.

At least we will then have gotten to the point where we are smart enough to ask them.

So I figure that when we come back here for the 14th Suppression Conference and I'm here with my cane and Kung is out there, gray haired now, getting a little old, he will have another research report and I think that's going to happen because I really don't think that we will find even ten years from now that we will have solved all the problems.

That doesn't deter me at least from proceeding to get something out there that we can use today. Seems to me I remember riding around in my grandfather's Model A and we got from here to there. I think we have to look at other residential applications than those which have yet been spoken to.

There is a possibility that there will be expansion of this basic concept into institutional. I personally see no reason to flood a nursing home as a basis for sprinkler protection. It seems to me a bed is a bed is a bed is a bed, whether it happens to be in my bedroom or a nursing home.

And if I can design a system and put the fire out properly with that scenario, why not use the same scenario whether it's in a nursing home or a bedroom? Matter of fact, maybe you can bust the cost a little lower there.

I think we have a lot of detail polishing and hardware methods and characteristics of piping systems. I have great hope for detection breakthroughs, and frankly feel like we should at some point in time even see the possibility of not just a little logic board, but maybe a silicon chip as the logic for putting a relatively small inexpensive piece of hardware together that really does the job.

As a practical economic matter, I think there is one overriding short-term need. It is the same one I mentioned the other day and it is the one that concerns me the greatest about how quickly we will get there.

We are currently at 27 gallons a minute or 32 if you include domestic flow as the total flow in a combined system. That is just too damn much water if we are going to get the job done economically.

Thank you.

MR. GERARD: Thank you, Rolf. I don't know whether we are ready for a coffee break or not. We are not. Our next speaker is Ed Reilly, who has the sprinkler industry's perspective for us. Of course, that's a big part of where we are going to go from here.

Ed.

Gentlemen, we have been together for seventeen hours in this room and in the next room. We began yesterday morning at nine o'clock and we left at five o'clock. And we started this morning at nine o'clock and after all these hours we are beginning to sort out the euphoric from the pessimistic, the myths from the facts, the romantic from the real.

We are the poeple who manufacture the product. We are the people who are going to install the systems. And we are the people who are going to be held accountable for what we do and we want to be held accountable for what we do.

In these seventeen hours I'm the first individual to come from the industry to speak to you, and it's important that you listen to what I have to say. We are the ones who are going to have to walk with responsibility, with maturity, with sobriety, and with accountability, for the things we say here today and for the things that we do in the next year.

Without the sprinkler industry, nothing is going to happen. We have a prepared address, and copies of that will be on the back table. And we have done it this way because we want to make certain that everyone in the Fire Administration and the fire protection community understands the position of the sprinkler industry, understands where we are coming from and where we are going.

It's the goal of the United States Fire Administration, as declared by Congress, to reduce fire losses by 50 percent in ten years. There can be no question that the most effective means to achieve this goal today is automatic sprinkler protection. No other vehicle available in the fire protection community offers such a high probability of achieving this aim. We are fully confident that the Administration's goal can be achieved if automatic sprinklers are installed in every residence in America. It is the sprinkler industry's fondest hope to serve the ends of the Administration to make American homes the safest in the world.

The sprinkler industry stands ready to cooperate with the Administration.

Just as the Administration needs the help of the sprinkler industry to achieve its admirable goals, so the sprinkler industry needs to be understood by the Administration if the ten-year goal of Congress is to be achieved.

It is about the state-of-the-art of the sprinkler industry as it now exists and of the concerns, risks and rewards that lie ahead that I want to speak to you today.

It's my feeling that after being involved in this whole business of residential sprinkler protection from the earliest days of President Nixon's appointment of Richard E. Bland of Penn State University as Chairman of the Commission that initiated the statutes that bring us to this room, that all of us have done too much talking and not enough listening.

We have all agreed from "day one" that sprinklers are the best answer to the question of protecting lives and property from fire. So let us listen to each other.

I want to tell you about the sprinkler industry, what we are like, our hopes, our concerns, our outlooks, our opportunities and yours, to share in the exciting adventures that lie ahead.

Most of the people with whom I have spoken from outside the industry view the problems connected with the development of residential sprinkler systems in extremely simplistic terms. It is my purpose today to help you understand the industry so that we can get on with the solutions to the problems and the opportunities that lie ahead.

At the outset, it would seem that we should dimension, describe and define what the automatic sprinkler industry is, what the National Automatic Sprinkler and Fire Control Association is and how they relate to each other. Our purposes, our goals, the nature of the sprinkler business, the state-of-the-art, our aspirations and purposes and outlook on fire protection in general and with respect to the question of residential protection in particular.

The construction industry, of which we are a part, is the largest industry in America. The sprinkler industry represents one one-hundredth of one percent of the total construction industry. On the average, a sprinkler system represents about one and a half percent of the total cost of the construction of a typical commercial, industrial, storage or institutional building. And commercial, industrial, storage, and institutional buildings represent only a fraction of the total construction of buildings in America. Because of automatic sprinkler protection, these classes of buildings have enjoyed an excellent record of immunity from fire losses.

While about 8,000 persons die annually in building fires, only about 20 per year lose their lives in sprinklered buildings. In virtually all cases, fire deaths have occurred by reason of extraordinary conditions, which have resulted either in the debilitation of a sprinkler system or of some malfunction predicated on human error.

There are no known records of multiple loss of life in sprinklered buildings, except in cases which involved explosions which destroyed the buildings and their sprinkler protection before sprinklers had a chance to operate.

Fragmentary cases of loss of life from fire where individual victims have become involved as human torches make up the few remaining cases of loss of life in sprinklered buildings.

Examples include a nursing home patient who sets fire to her flimsy apparel or auto mechanic worker who drops his light in gasoline vapors and becomes a human torch. Or so-called cold fires where low calorific output followed by incomplete combustion and carbon monoxide exist.

So the record to safety in life of sprinklered buildings has been outstanding. This is a country with an extraordinary record of property conservation. Our best estimates, loss ratios in sprinklered buildings probably reach only about one one-hundredth of the dollar losses in unsprinklered buildings.

The fact that fire insurance premiums can be discounted from 40 to 95 percent speak well of the performance of sprinklers in this class and these classes of buildings.

By our best estimate, about 25,000 sprinkler systems are installed in the United States every year. The average system costs about $40,000 and protects an occupancy encompassing about 50,000 square feet. These total installations range in the order of about a billion dollars a year, or between one and two percent of the total cost of sprinklered buildings.

If one comprehends the redundancy of requirements for multiple fire protectives integrated into American building codes, the total cost of sprinklered buildings (for example, every building code in America requires standpipes and hose systems in high rise buildings) this requirement applies to both sprinklered and unsprinklered buildings, so the additional cost of overhead sprinkler piping through high rise buildings connected to risers and hose systems, with their accompanying water supply systems, including tanks and reservoirs and fire pumps and underground mains, adds only modestly to the cost of standpipe systems required whether sprinklers are provided or not.

Sprinklers, control valves, and related appurtenances that comprise a sprinkler system manufactured by sprinkler manufacturers, probably reach about $35 million year or about 3.5 percent of the sprinkler industry. Three and a half percent represents the manufactured products made by sprinkler manufacturers out of a billion dollars.

Additionally, sprinkler components manufactured outside the industry, that is, fire pumps, gravity tanks, reservoirs, hangers, butterfly valves, etc., range about another $50 million, or about five percent more.

From the foundry to the inspector's test on a completed system, both sprinkler manufacturers and contractors operate in a completely controlled environment. And this is very important to understand.

The manufacturer of an automatic sprinkler system, alarm valve, dry valve or any other component is subject to the most rigorous quality control of the Underwriters Laboratories or the Factory Mutual Laboratories. Their stringent standards govern the manufacturing and established performance levels of components which are designed to be integrated into systems.

For example, every listed sprinkler is required to pass up to forty or more tests described in rigorous standards promulgated by these nationally recognized testing laboratories.

Both laboratories maintain field inspection forces; engineering technicians from the laboratories perform spot checks and regularly perform tests in the factories where sprinklers are made.

The current listed automatic sprinkler is one of the most rugged and durable components found in any building. For example, every listed sprinkler must undergo severe hydrostatic tests. You heard about that yesterday. Every sprinkler must withstand 500 psi for a minute in the laboratory test, 300 psi for 30 days, 875 psi on spurt tests, without rupture.

Sprinklers are subject to water hammer tests with increasing rapid battering of the orifice underside of the metallic seat or disc under pressures ranging from 50 to 500 psi.

Sprinklers are subject to low frequency vibration tests in anticipation to their real world exposure to air hammers, railroad vibrations, rivet materials, and the like and other industrial noises that lead to metal fatigue and failure of sprinklers. Industrial sprinklers are subjected to tests performed by the laboratory technician to expose them to salt spray and hydrogen sulfide and the hostile atmosphere environment that could destroy the sprinkler were it not built to the highest metallurgic standards.

Residential fire test data at Factory Mutual suggests that if residential sprinklers are to operate effectively in the most severe and challenging kinds of fire environments found in homes, they must operate at least five times faster than the fastest commercially available sprinkler.

If residential sprinklers are expected to maintain a tenable heat environment and tolerable carbon monoxide levels, they must be at least five times more heat sensitive than conventional listed sprinklers.

The current state of the manufacturing art suggests that when sensitivity of a sprinkler is increased, other performance characteristics of sprinklers decrease. Sensitivity and structural strength are currently thought to be in inverse ratio to each other.

Ability to withstand hydrostatic pressure tests, severe vibration tests, or corrosive atmosphere all tend to decline as the mass of the fusing mechanism is reduced to decrease heat sink and speed up the shatter point of the element.

Of the dozens of tests to which listed sprinklers are subjected in the laboratories, prototype residential sprinklers can probably pass only four. So there's no way the residential prototypes that we have now can pass the current industrial standard.

I think that's got to be made clear. We are now told that before residential sprinklers are listed for service, they must be at least equal, this came out yesterday on the floor, to currently listed residential sprinklers in all respects, including structural and hydrostatic integrity and still be five times more sensitive.

If this turns out to be a minimum laboratory requirement predicated on what 13D is currently telling us, the sprinkler manufacturer will be faced with design dilemmas to which there appear to be no known solutions at this moment.

The environment into which the sprinklers are to be introduced for service is a highly controlled one. This "controlled environment" extends beyond the factory and the laboratory. It goes to the nature of the automatic sprinkler contracting business, and includes the kind of physical environment that industrial sprinklers inhabit.

Sprinkler systems are designed in accordance with nationally recognized installation standards, including 13 and 231 and 231C and D and so forth and related installation standards.

Working drawings or plans controlling the design of sprinkler systems, conventional sprinkler systems, are prepared by fire protection contractors. Some preliminary plans are occasionally drawn by architects or consulting engineers. But actual working drawings, shop drawings, are invariably prepared by the contractor's engineering draftsman.

Sprinkler plans must conform to NFPA standards. Plans are then reviewed by insurance engineering authorities for rate making purposes. It must then either be approved by the Building Department or by a fire prevention bureau.

Building codes require that systems be inspected or approved by the legal authority having jurisdiction. So industrial commerical sprinkler systems are subject to controls that could not be anticipated or even legally permitted in residential occupancies.

The traditional jurisdictional or juratical doctrine of "my home is my castle" precludes the kind of controlled environment that characterizes the industrial and commercial installation with all of its reviews, approvals, and inspections.

So residential installations would be immune from regulations and controls which prevailed in commercial and industrial properties. Further, inspection service contracts intended to maintain a high degree of reliability of systems in commercial and industrial buildings would not be possible in residential occupancies.

The right of entry, constitutional right of entry, by fire officers for the purpose of inspection applies only to buildings of public assembly, not to residences. The point we are making is that commercial and industrial sprinklers today exist in a completely different world than residential sprinklers of tomorrow.

It should be clear that the sprinkler industry does not expect to install commercial sprinklers in the same systems or in the same properties with residential sprinklers because of the different environments in which they are expected to live.

Manufacturing standards for residential sprinklers should preclude their compatibility with commercial and industrial sprinklers.

What we are saying is that two kinds of sprinklers do not belong together in the same system. It would, therefore, be our view that the residential sprinkler will create a whole new kind of sprinkler industry. The standards governing the manufacture must be different because conventional sprinklers are intended to occupy controlled environments; residential sprinklers in uncontrolled environments, with concomitantly greater probability of malfunction based on lower levels of surveillance, less maintenance, more unskilled care.

Residential occupancies open an environment that creates new challenges for builders and home owners, for tenants, and especially for the sprinkler industry. Take the one- or two-family dwelling unit. Let's assume an average of between 2,000 and 3,000 square feet of living space. It would be feasible to install a sprinkler system for less than $1,200, in 1979 dollars. About $500 in material and estimates I have heard from contractors who have done it have been lower than this, and about $600 in labor.

These estimates assume a reasonable estimate for overhead and profit. Of the $500 in material cost, the sprinkler manufacturer could be expected to provide about 20 percent of it or about $100 worth of sprinklers for every home.

How are these systems being installed? By whom? Who will provide the motivation for the home owners to protect their families from fire?

Let's assume we have the hardware. It's approved by the testing laboratories, let's even assume that. We further assume that the installation standard has been promulgated by NFPA and that the approved components are in production and ready for marketing. Such systems could be installed by home owners, by plumbers, by specialty contractors, or by fire equipment distributors.

Residential sprinklers will be introduced into a totally uncontrolled environment. At the moment we have no way of certifying the skill of ample numbers of craftsmen to install them. There is no legal way of requiring inspection or maintenance.

Current unlisted prototypes of sprinklers are prone to leakage, structural failure, or premature operation, much more so than industrial sprinklers. Low ceilings in homes make them more vulnerable to damage and abuse.

So sprinkler manufacturers will face high risks of litigation from home owners who could seek redress from water damage or even from personal injury or loss of life. The controlled environment into which a $40,000 industrial sprinkler system is introduced is exposed to far less risk, liability risk I'm talking about now, than a system in an uncontrolled environment with an investment of $100 in sprinkler equipment per home.

So the sprinkler industry's first obligation is to survive if it's going to serve. The ration of risk to reward in today's litigious climate would cause any reasonable businessman who hopes to be in business five years from now to avoid jeopardizing his business and livelihood without some kind of indemnification from a government that wills its people the highest level of fire protection in the world.

The residential market offers none of the protections of plan review, of systems inspection, of mandatory maintenance and repair. Gone is the right of entry of fire inspectors to come into a building and order the owner to repair his system. And the prototype of existing hardware portends more frequent, not less, more frequent device failure.

If any average one- or two-family home contains a hundred dollars in listed sprinklers in a completely uncontrolled environment, the potential liability for the manufacturer and the installer is a thousand times that amount.

So the industry needs some form of federal indemnification, some immunity from tort law, some assurance against financial disaster resulting from lawsuits that could range from drenched rugs to damaged paintings to personal injury or loss of life.

There's ample precedent for federal indemnification. Several years ago drug manufacturers were provided with a federal indemnification underwriting which lifted from the manufacturers the burden and the cost resulting from litigation. This was done in connection with the swine flu innoculation required by the government several years ago.

Without some kind of tort relief for manufacturers and installers in the sprinkler industry, we would find ourselves in a parallel position to the drug industry of a few years ago.

The industry certainly endorses the one vast remedy for the illness, but the industry also recognizes the perils of redress from civil courts should the remedy fail in isolated cases.

Several states have enacted good samaritan laws to protect doctors from redress from those to whom they minister or from the hapless families of victims of accidents who die after being treated by a doctor who seeks to bring his healing power to a fellow citizen.

High malpractice insurance premiums have driven doctors to go naked, conditions scarcely desired by sprinkler manufacturers or installers.

Secondly, if home owners are to voluntarily elect to install a sprinkler system, they must perceive some kind of cost benefit. This could only be achieved through some form of motivation which would induce the home owner to protect his family against the ravages of fire.

Two things are needed. First, a public awareness program sponsored by the United States Fire Administration to acquaint the home owner with the importance of protecting his family from fire. This has been alluded to in connection with the work of the NFPA in this regard, public education, public awareness program.

Secondly, tax incentives must be introduced into the Internal Revenue Code which would recognize private fire protection as a complement to public fire protection. By installing fire protection systems, the citizens will be alleviated of the tax burden of providing public fire department protection. This serves as a kind of federal aid to local fire districts in recognition of the on site or built in automatic fire suppression systems.

This could probably be done through the regulatory process rather than through congressional action.

The sprinkler industry stands ready to provide counsel and advice to the United States Fire Administration in forming specific language to amend the Internal Revenue Code to achieve these goals. But it should be clearly understood that the National Automatic Sprinkler and Fire Control Association will not undertake any direct intervention either into the regulatory or the legislative process.

To say it another way, the National Automatic Sprinkler and Fire Control Association has no intention of promoting the adoption of legislation or regulations to require tax relief or to expand its market through lobbying activities.

We will, however, offer whatever advice and counsel that is required by the United States Fire Administration in the pursuit of its goals and to reduce the loss of life from fire.

In closing, the solutions to technical problems are now within our grasp. The sprinkler industry lauds and supports the aims of the United States Fire Administration in reducing loss of life by 50 percent in 10 years. We urge a strong public awareness program to make our citizens aware of the one best tool to accomplish this goal.

This should be done immediately after a federal indemnification program has been put into practice and should be done concurrently with the enactment of amendments to the Internal Revenue Code designed to provide tax relief for home owners who freely elect to protect their families from the ravages of fire by the best known means, automatic sprinklers.

Thank you.

MR. GERARD: Thank you, Ed. Now while the coffee and Coke is ready outside, if you all want to go out and decide whether the Automatic Sprinkler Association ought to be added to the list of Lockheed and Chrysler, and if you'll come back in about 20 minutes, which will put us at 3:25, we will finish this up so everybody can catch their airplanes.

MR. GERARD: Our last speaker on the panel today, Phil Favro, State Fire Marshal from the great State of California. The thought occurred to me earlier that were it not for the New York Fire Department protecting the Atlantic Ocean and the Los Angeles Fire Department protecting the Pacific Ocean, they would probably both burn up.

My favorite State Fire Marshal, Phil Favro.

Thank you, Jack.

Well, I guess my job is to also answer the question where do we go from here. It's going to be kind of interesting because I think an awful lot has been said and as is typical of someone late on the program, everything I thought was original when I sat down to put this together has already been said and is not original after all.

I detected in his presentation an air of pessimism, but I think underneath there really is probably some optimistic or something optimistic behind it. But be that as it may, I'm going to go on with what I prepared in hopes that it will help to offset some of the things more quickly than some others have said we are moving at the present time.

As I view where we are going from here, I see two basic areas of concern. First of all, I know where we are going in California and I know how long we have to get there and I have a pretty good idea of how we are going to get there. At least I had until today.

Because on July 23 of this year the California legislature took what I believe to be a very significant step in the area of fire protection.

They passed a measure calling for the state fire marshal to adopt standards for the design, installation, and maintenance of automatic sprinkler systems for one- and two-family dwellings. Now, that resolution by the California legislature is significant for many reasons, not the least of which is its indication of the growing awareness of residential fire loss on the part of legislators, elected officials, and high-level policy makers.

And I think the language contained in that resolution is revealing in its assessment of the situation. The resolution states that the problem, and I quote, "The major fire problem in California is in one- and two-family dwellings. One- and two-family dwelling fires last year resulted in 200 deaths, 858 injuries and over $55 million in property loss."

The resolution futher states and declares a need for reduced costs by saying, "Less costly ways of providing public fire protection must be explored."

It goes on to state the inadequacy of present standards by saying that "costly rigid national standards discourage the use of automatic fire sprinkler systems in one- and two-family dwellings". It acknowledges the effectiveness of sprinklers by saying that "automatic fire sprinkler systems have been proven that they can be effective in eliminating loss of life to fire in one- and two-family dwellings".

Finally, it recognized the extent of present technology by saying "low cost and efficient sprinkler systems for the home are now becoming available". Notice I said "becoming".

That resolution in California is a mandate of major significance, but its passage wasn't easy. Some of the reasons for that lack of ease you have heard here today. As might be expected, there was an effort on the part of the National Association of Home Builders, and others, to defeat it, and their standard objection was that it would add to the already spiraling cost of housing.

I certainly have to agree that it would.

But that opposition was countered with what I believe to be a key element in the resolution and that key was that it calls for voluntary standards, and I think that's essential at this point in the game.

These are not intended to be mandatory standards. They are intended to be voluntary standards so that local officials, in attempting to grasp the problem, will have another tool to use. And with that voluntary statement in the resolution, I think we neutralize the opposition and hopefully get them on our side in trying to do something about it down the line.

When will our task be completed? That is adoption of this standard. The legislature has given us until December 31, 1980, to come up with the suggested standards. So we are probably on the same timetable as the NFPA 13D revision is. And I should say that certainly we don't intend to deviate from that. What we intend to do is start moving on it. We felt if we waited, we may never get anything done. I think that's been brought out.

We decided to go ahead and start something. If NFPA 13D is done, we will use it, I don't have problems with that. If not, hopefully we will use the work they accomplished in promulgating our standards.

That leads me to the question of how do we get there. Certainly not by magic. I know we will use every means at our disposal, including conferences like this, the test results of the LA burn, Charlotte tests, experiments and theories of fire engineers and everything else that's been done.

In short, without this standard, as Chief Casper said today and as others have said, we will still be around perhaps in 10 years trying to get all the bugs out and I think it's time that we moved.

I said there were two areas where we can go. That's one. But that resolution in California - in fact, the whole panel's charge here, where do we go from here - will only result in wheel spinning without aggressive and unflinching leadership from the fire community. And if there's any charge that we must take back with us, it's the leadership that's necessary to get these things going.

I view the low-cost or the development of low-cost residential sprinkler systems as only one step or only one tool in what must be a broad based aggressive attack on mitigating fire loss. And I think the key effect of Senate Concurrent Resolution 23 in California, the key effect of this whole effort will be development of this one weapon in that attack and that weapon is to be used or can be used by local building or fire officials to creatively formulate systems of survival for the citizens of California and the nation.

One of the problems that we have today in California is the unwillingness on the part of many local officials to accept even voluntary installation of sprinkler systems because of the lack of adequate standards against which to judge them. And that unwillingness is compounded by a classic dilemma, a conceptual acceptance on their part that these systems are needed, but an inability on their part to judge these systems' worth.

This morning you heard that Tony Shaw has a sprinkler system in his house and others here have installed sprinkler systems voluntarily in their homes. There are portions of California today where that would not be possible because local building and fire officials would not allow them to be put in because there were no standards against which to judge them.

So I think that's a problem. If we establish a standard, at least that hinderance will be cast aside. I said that we have to develop this tool. But the key is not the development, because I think we are part of the way there. The key is that the weapon and the tool must be used. We in the fire community, and I use the term fire community to include everyone from the fire fighter on the back step to scientists and technicians and engineers who are working on the fringes and whose efforts are probably part of what we are looking for, we in the fire community must be at the forefront of the movement by presenting attractive alternatives to the people.

And attractive alternatives to those people who make decisions for the people. And whether it's the development and use of residential sprinkler systems or the current movement to require the manufacturer of self-extinguishing cigarettes or efforts on the part of the flammability standards as we have heard this morning, the fact is that alternates must be presented and, if accepted, they must be implemented and evaluated.

For years, NFPA has gathered and analyzed data on fire loss in America. In the last five years the U. S. Fire Administration has developed and begun to implement the National Fire Incident Reporting System to gather and analyze data.

In California, as in many states, there are on-line systems for the gathering and analysis of data. But what have we done with all of that information? Have we used it? Have we used it in all its facets and forms to sell attractive alternatives to our historical approach to the fire problem?

By and large we haven't. By and large we continue to go about things in the same old way. Some things. "Residential fires are our biggest problem." "Arson is the fastest growing crime in America." "Annually, there are 7,500 to 8,000 fire deaths." "Fire fighting is the most dangerous profession in the country." These are all idiomatic phrases of fire people.

That information has been pounded into the public, it has been pounded into policy makers, it has been pounded into each one of us.

With what effect? Have we shown a reduction in fire loss? Have losses actually come down? Have they even maintained their stability? The latest figures from INFIRS indicate they may be going up.

So where do we go from here? As far as I'm concerned, we use that information - the fact of residential fire loss, the growth of arson, the number of deaths we have, and the fact that fire fighting is our most dangerous profession, we use those facts, we find out why, I think that's critical, we find out why these things are happening, and then we formulate creative solutions to those problems. And, again, we present attractive alternatives.

I, for one, and I hope others will readily admit that mandated protection really has very limited effect on changing one's personal chances of survival from his own acts if it depends on his active participation. I think the highway death toll as was alluded to this morning is a good indication of that. We can put a seat belt in the car but we can't make people use it.

But I think that most safety experts will agree that passive measures can be very effective in reducing the risks to individuals from their own acts. Flammable fabrics, flammable sleep wear, for instance, for children, has been a very effective program. It really has gotten the problem under control. Of course, air bags if they were introduced in automobiles would also save many, many lives. And one of these passive measures that I see is certainly the inclusion of residential sprinkler systems.

There's no doubt that they will save lives and property despite the idiotic acts of many of our citizens. So again, the kicker, the real challenge, is getting them installed. The standard is coming, the most capable minds in the country, those of you here today, those who were here yesterday, are developing it. It will be here, whether in a modified form of 13D or in the adoption of something totally new, it will be done.

Again, where do we go from here? We work our tails off to get it implemented. And that will mean tradeoffs in the code, it will mean a more intelligent promulgation of regulations when these standards are developed, it will mean overcoming built-in resistance of the fire protection community, of the regulatory authorities, of industry, of the government and, of course, the public, to accept these new ideas and approaches.

It will mean overcoming the subtle opposition of those who profit from fires in this country, and I don't necessarily mean arsonists or those who pay them.

It will mean an increased use of fire protection engineers in fire departments to allow an engineered approach rather than an after-the-fact reaction. And it will mean convincing fire fighters of the value of prevention activities.

Chief Casper mentioned this morning that the fire service was ready. And I wish he was here because I'm not convinced that they are ready, and it's time that they were.

It will mean being honest with people in our neighborhood when assessing the value of each of their neighborhood fire stations and whether or not it is really needed.

It will mean the deregulation of attendant exhorbitant appliance costs, which costs take away many of the systems and put them out of reach of the average citizen.

In short, it will take the committed effort of each of us in the fire community to provide the leadership to transfer the products of our research to the real world. And it won't be easy. But that's our challenge and as far as I'm concerned that's where we go from here.

Thank you.

MR. GERARD: Thank you, Phil. Well, I guess that sums it all up pretty well. The basic question: Are you concerned about property loss and life loss in residential occupancies? If you are, then we need to decide what is the best or most practical approach to dealing with life loss and property loss.

Most everyone so far has agreed that sprinklers are the second best way to achieve that. The best way, obviously, is for the American people to stop burning up America. But given that as an unrealistic goal, the most practical and most realistic way is to try to achieve the safety from fire by adopting the same philosophy we have in other areas, and that's to provide a device someone can buy to take the place of their own involvement.

I don't say that in a derogatory way, that's just the way the system is, that's the way we function. Rolf Jensen pointed out that sprinklers, historically have been the best approach, and I think we all know that. Sprinkler systems in industry have been around for a hundred years. But remember Jack Rhodes pointed out that while they have been around for a hundred years, they are still being improved.

So those people who are waiting for the perfect system perhaps ought to ask themselves, Should we have been waiting the last hundred years for the perfect industrial system? I don't really think so. I think we should move ahead.

As the tests are conducted and reports are published, there will be people, both in-house and without, who will interpret pieces and parts of the data and reach their own strange conclusions that will prove what they want to prove.

Some people, if they agree with you, they are right, if they don't, they are wrong. But the process, the NFPA process is for everyone to have their opportunity to express their reservations, their concerns, their opposition, their support, to have a full and complete expression before a standard is adopted.

And I think we need to do that. We have heard a lot of that these last two days. But we also need to keep in mind that like the hurdler who runs the hundred yard dash with some hurdles to get over, the hurdler that focuses on the hurdles loses the race. The hurdler that focusses on the objective and develops the skill to overcome the hurdles as they come up is the one who wins the race.

I think we can focus on the objections, we can focus on the reservations and the concerns, and if we do, we will be here at the fourteenth fire suppression conference still trying to adopt a standard.

There's no doubt in my mind we will be here for a fourteenth conference someplace because hopefully this will be a developmental system and will continue to improve and improve and improve.

Harry Shaw laid out the things and they have been reviewed by Jack Love and others - Phase 1, developing the standard. Phase 2, supporting the standard once it is adopted. Phase 3, improving of performance and marketability. And those first three phases fit into a separate category from Phase 4, which is promotion of the standard.

And Ron Coleman, chief in San Clemente, categorized those two features the other day in a meeting and he pointed out that phase one, two, and three are technical in nature, technological. A lot of the arguments about why this isn't going to work, or why it's going to take too long, or why it will be too expensive, or why nobody will put it in their hose, are philosophical. They are not technical.

If 13D is adopted and never used, it can still be a good standard. It probably wouldn't last too long if nobody ever used it. But that would not mean that technically it is not a good standard.

13D, as other standards, can and will be adopted by local agencies based on their philosophy. It can be voluntary, it can also be mandatory. But that's a local decision. And I think one of the things we need to do is to sort out the comments that we have heard from these past two days and separate the technical from the philosophical.

And if it's philosophy, fine, recognize it as philosophy. But don't decide that the technical aspect of a standard is not good simply because someone philosophically doesn't agree with it.

And I think that's very important for us to keep sight of. Technology has nothing to do with whether the National Association of Home Builders likes the standard. It has nothing to do with whether it's going to solve all the problems with the plastics industry. Those are entirely separate issues.

The issue is: Can we write a standard that will achieve our objective, which is improving fire and life loss in residential occupancies? That's what it's all about. And that's what we need to keep focused on.

The promotion of residential sprinklers may be accomplished. I think that's going to be the most difficult task of all. Those of you who have been involved for any length of time trying to convince the American people that there is, in fact, a fire problem know that that is a very difficult thing to do. People simply don't accept that, for a lot of reasons.

Selling the system will be the most difficult, but I think we should not get caught up in denying the technical feasibility of the system based on philosophy.

We have heard a lot of good arguments both for and against the standard. The difference, I believe, between success and failure of this program is a commitment of the people in this room. If we commit ourselves to developing a feasible technical standard and then commit ourselves to seeing that it's adopted in whatever fashion we feel is philosophically right for our community, whether that's voluntary or mandatory or some combination of that, is a local philosophical decision.

But I believe the first thing we have to do is commit ourselves to getting that standard ready and getting it adopted. And that will take up our efforts for the next year or two. Then we can worry about promoting it.

That is the last of it. I think we will have about 10 minutes of questions and answers if you have some questions. We will be happy to answer them. Rolf Jensen asked that he be excused so we gave him our blessing and let him go. He answered a lot of questions anyhow. But the rest of us are here if you have any questions.

Looks like everybody wants to go catch an airplane. Are there any questions for any of the panelists? Do any of the panelists have any questions of each other?

Then I think I'll turn it back to Mr. Love from Factory Mutual and I thank you very much, those of you who stayed to the very last, you're beautiful people, thank you.

MR. LOVE: (Moderator) Thank you, John. Well, there can be no question about the last speaker's interest in fire prevention nor, in fact, his contribution to fire prevention.

Gordon Vickery opened this session representing the USFA, and it's certainly fitting that it be closed by Charlie Morgan, the President of NFPA. Charlie.

CLOSING REMARKS

Charles S. Morgan

President

National Fire Protection Association

Thank you, Jack.

We have come to the end of what for me, and I hope also for you, has been an exciting two days. I've attended a great many fire safety conferences over the years but never, I think, one more hopeful for the future than this one.

Jack Rhodes said it well when he observed yesterday that we are standing on the "threshold of a new era in fire protection engineering" and that this meeting is an important milestone in the long history of fixed fire protection systems. If any of you doubted that appraisal yesterday, I suspect that by now you accept it completely.

The framers of this two-day conference deserve a tip of the hat for a comprehensive and lively program that has led each of us, whatever his level of prior knowledge, step by step through a review of the residential fire problem, the efforts of the past six or seven years to develop a practical solution, the technical and economic difficulties that have been overcome and those yet in our path to success, the criteria that must be the measure of that success, and the plan for meeting them in the months that lie ahead. The speakers and panelists have our gratitude for their forthright, clear and lucid presentations and for the directness with which they have handled questions. They have not minimized the difficulties of their work, nor underestimated the limits of present knowledge or the necessity of finding the answers to many technical questions still hanging. Nevertheless, they have left us with a strong sense of hope and confidence that the answers will be found and that before we are much older a practical low-cost sprinkler system for life safety and home preservation in residential properties or in one- and two-family dwellings will be a reality. And then we can get on with the no less important task of promoting the concept to the public and creating the sort of market that holds the key to our goal.

Yesterday, Bob Grant described us as "pioneers in the employment of a tried and true solution, refined and augmented by new technology, to solve an old and persistent problem." Certainly we have been in the presence of a great many genuine pioneers who have shared their knowledge and experience with the rest of us. The experimentation that went on at Factory Mutual in Norwood was clearly pioneering, but that's no new role for them. The innovative designs offered by the sprinkler manufacturers also represented a pioneering approach. The elaborate and highly competent testing conducted by the Los Angeles Fire Department was surely pioneering, thrusting back the frontiers of our knowledge. The imaginative and courageous approaches to application in Anne Arundel County and at San Clemente are truly pioneering in character.

It seems to me, too, that the entire project has had a major pioneering aspect. It is a new exemplification of what good things can happen when the federal government plays a helpful and cooperative role with other players longer on the field, the private sector and the municipal governments. This is not always characteristic of federal agencies and I would be wrong if I failed to acknowledge with much gratitude the enormously constructive role in which the U.S. Fire Administration has cast itself in this so important project. The support of Gordon Vickery and the dogged dedication of Harry Shaw in pursuit of our common goal are qualities which I am sure we all appreciate greatly.

We have heard several views of the ultimate impact of one-day commonplace sprinkler protection in residences, its relationship to the relative combustibility of the dwellings, and something of its impact on the esoteric world of insurance rating. In the latter connection, we have heard about a new series of LAFD experimental fires conducted for the specific purpose of evaluating the actual impact of such sprinkler systems on the real world of loss and insurance claim experience. Ralph Jackson reported that the insurance executives whom he approached to sponsor and participate in this unique experiment were not only enthusiastic but downright "excited." This I think is noteworthy because it is my experience that it takes a whole lot to cause an insurance underwriter a sense of excitement. They are a pretty sober lot.

We have heard pleas for greater speed and while I am sure we want to move forward as rapidly as is prudent and consistent with our knowledge and ability to assure reliability of performance, our sense of caution must not be diminished. It seems clear that there remains much we do not yet know. We can ill afford to be stampeded by our own enthusiasm into promotion of a new answer, any failure of which in the real world would strike a serious, perhaps fatal blow to the tremendous advances already gained. In any life safety system, reliability and integrity are the most important attributes we must protect. And this philosophy extends to the dangers of misapplication of a system to occupancies and circumstances to which it is not properly suited. Let's not overlook the fact that a partial system employing currently available standard sprinklers is quite a different proposition from a system developed around a newly designed sprinkler that is not yet ready for the market.

And so we come to the end of this Conference with gratitude to the many who have addressed us and shared their knowledge. They are leaving us not only better informed and more understanding of the achievements to date and of the real challenges that are ahead. They leave us with a renewed sense of confidence: indeed, of inspiration and determination that the goal is almost within our outreached hands. We are now assured that by perserverance and continued close cooperation we shall reach our goal, that future Americans will be safer from fire in their own homes than ever in our history, and that untold thousands who would otherwise die in fire will live.

Good-bye and God bless.

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